Kurdistan Region – Iraq 0001 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours **A** 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

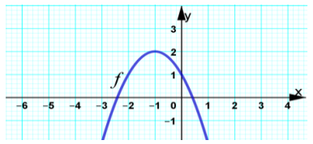
SN: 400000001

Answer the following questions : (two marks for each right choice)

1. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



2. The range of which of the following functions is $]-\infty,-2\,]$?

A. $f(x) = -\sqrt{x} - 2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x} - 2$

3. The y –intercept of the line $y = -3x - 4$ is :

A. $(0\,,4\,)$ **B.** $(0\,,-4\,)$ **C.** $(0\,,3\,)$ **D.** $(0\,,-3\,)$

4. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,] \cup [5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,] \cup [2\,,+\infty[$

5. Find the value of ($\boldsymbol{b}$) so that the points $(3\,,-4\,)$, $(2\,,\boldsymbol{b}\,)$ and $(1\,,2\,)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

6. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

7. Which of the following is false ?

A. The distance between the point $(\,\boldsymbol{3}\,,\boldsymbol{-7}\,)$ and the line $\boldsymbol{y = 5}$ is $\boldsymbol{12}$.

B. The lines $\boldsymbol{3x + 4y = 10}$ and $\boldsymbol{4x - 3y = 14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x) = \frac{-2x}{3x-2}}$ is $\boldsymbol{R - \left\{\frac{2}{3}\right\}}$.

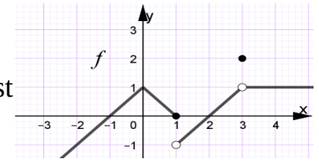
D. The graph of the function $\boldsymbol{f(x) = |x+4|}$ is symmetric with respect to the y –axis .

8. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

9. Use the given graph on the right to find the result of $\lim\limits_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



10. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

11. Find the value of $(\boldsymbol{a})$ so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \geq 0 \end{cases}$

will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D.** $\frac{1}{8}$

12. The result of $\lim\limits_{x\to 2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

13. The result of $\lim\limits_{x\to 3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

14. The result of $\lim\limits_{x\to 4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

15. The function $f(x) = \begin{cases} x & x < 1 \\ 2 & x = 1 \\ 2x - 1 & x > 1 \end{cases}$ is discontinuous at $x = 1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to 1} f(x)$ does not exist .

C. $\lim\limits_{x\to 1} f(x) \neq f(1)$ **D.** $\lim\limits_{x\to 1} f(x) = f(1)$

16. Which of the following is true ?

A. $\lim\limits_{x\to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim\limits_{x\to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim\limits_{x\to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D** .$\lim\limits_{x\to 0} \frac{1-cosx}{sinx} = 0$

17. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between $\boldsymbol{-2}$ and $\boldsymbol{0}$.

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

18. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

19. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $\boldsymbol{x = -2}$ **C.** $x = 6$ **D .** $x = -6$

20. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ln x$

21. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

22. Find the result of $\lim\limits_{x\to 0} \frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

23. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

24. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

A. $y = \frac{-3}{4}x + 8$ **B.** $y = \frac{3}{4}x + 2$ **C.** $y = \frac{3}{4}x - 7$ **D.** $y = \frac{1}{4}x + 4$

25. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to 0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

26. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

27. Find the second derivative of the function $f(x) = x\,sinx + cosx$.

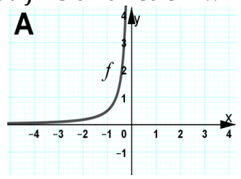
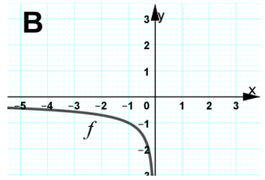
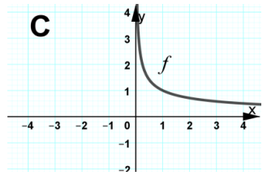
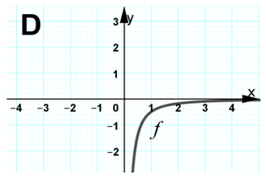
A. $f''(x) = -x\,sinx + cosx$ **B.** $f''(x) = x\,cosx + 2sinx$

C. $f''(x) = -x\,cosx + sinx$ **D.** $f''(x) = x\,sinx - 2cosx$

28. In which interval is the function $f(x) = e^{x^3-6x^2+8}$ increasing ?

A. $]-\infty, 4[$ **B.** $]2, 4[$ **C.** $]0, 4[$ **D.** $]-\infty, 0[\cup]4, +\infty[$

29. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

A 
B 
C 
D 

30. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

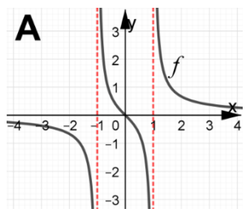
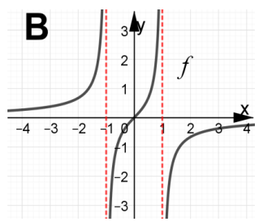
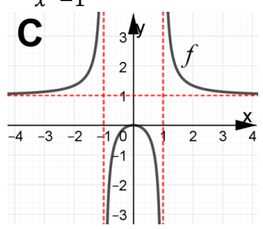
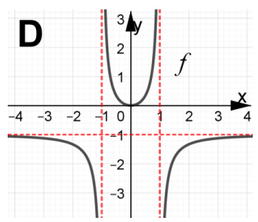
A. $(0, 0)$ **B.** $(1, 2)$ **C.** $(0, 2)$ **D.** $(-1, 2)$

31. The result of $\lim\limits_{x\to-\infty} \frac{3x}{4\cos x - 2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

32. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :

A. $y = 3x + 8$ **B.** $y = 3x - 8$ **C.** $y = x + 3$ **D.** $y = x - 3$

33. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.

A 
B 
C 
D 

34. If $f(x) = a\,x^3 + x$ find the value of a where $f'(2) = 13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

35. Which of the following is false ?

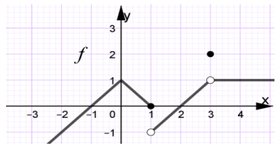
A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim\limits_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim\limits_{x\to1^-} \frac{3}{1-x} = +\infty$

36. Find the equation of the line that passes through the point $(-2, 5)$ and that is parallel to the line $3x + y = -5$.

A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

37. Use the given graph on the right to find the result of $\lim\limits_{x\to1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



38. Find the equation of the line that passes through the points $(2, 0)$ and $(0, -3)$

A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

39. Find the result of $\lim\limits_{x\to1} \frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

40. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

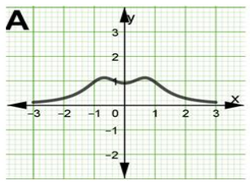
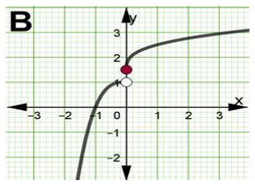
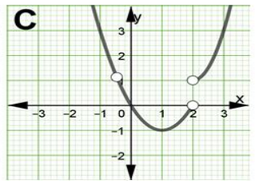
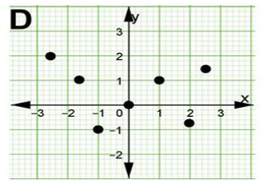
41. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

42. Which of the following function is odd ?

A. $f(x) = 2x\,sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

43. Which of the following graphs represents a one - to - one function?

A 
B 
C 
D 

44. Find the critical value of the function $\boldsymbol{f(x) = x^3 + 6x - 5}$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

45. Redefine the function $f(x) = \frac{x^2-4x-12}{x-6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 4 & x = 6 \end{cases}$ **B.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 12 & x = 6 \end{cases}$

C. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 8 & x = 6 \end{cases}$ **D.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ -2 & x = 6 \end{cases}$

46. If $3 - (\frac{1}{4}x - 1)^3 \leq f(x) \leq 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

47. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

48. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x) = x^3 - 2x^2 + 1$ **B.** $f(x) = x^2 - 2x^3 + 1$

C. $f(x) = x^4 - 2x^3 + 1$ **D.** $f(x) = x^3 - 2x^4 + 1$

49. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3-2x^2}{1-2x^3}$.

A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

50. The points of intersection of the functions $f(x) = x^2 + 2x$ *and* $g(x) = x + 2$. is

A. $\begin{cases}(1, 3)\\(2, 0)\end{cases}$ **B.** $\begin{cases}(-1, 3)\\(2, 0)\end{cases}$ **C.** $\begin{cases}(1, 3)\\(-2, 0)\end{cases}$ **D.** $\begin{cases}(-1, -1)\\(2, 4)\end{cases}$

Kurdistan Region – Iraq 0002 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours **B** 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000002

Answer the following questions : (two marks for each right choice)

1. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ln x$

2. Find the equation of the line that passes through the points $(2,0)$ and $(0,-3)$

A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

3. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim_{x\to1^-} \frac{3}{1-x} = +\infty$

4. Find the second derivative of the function $f(x) = x\,sinx + cosx$.

A. $f''(x) = -x\,sinx + cosx$ **B.** $f''(x) = x\,cosx + 2sinx$

C. $f''(x) = -x\,cosx + sinx$ **D.** $f''(x) = x\,sinx - 2cosx$

5. Find the result of $\lim_{x\to0} \frac{e^x - 1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

6. If $f(x) = a\,x^3 + x$ find the value of $\boldsymbol{a}$ where $f'(2) = 13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

7. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

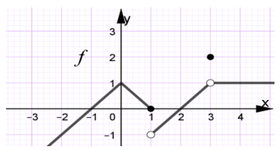
8. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between -2 and 0 .

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

9. Use the given graph on the right to find the result of $\lim_{x\to1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



10. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

11. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x + y = -5$.

A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

12. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

13. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2\ ,5\ ]$ **B.** $]-\infty,-2\ ] \cup [5\ ,+\infty[$ **C.** $[-5\ ,2\ ]$ **D.** $]-\infty,-5\ ] \cup [2\ ,+\infty[$

14. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :

A. $y = 3x + 8$ **B.** $y = 3x - 8$ **C.** $y = x + 3$ **D.** $y = x - 3$

15. The y –intercept of the line $y = -3x - 4$ is :

A. $(0\ ,4\ )$ **B.** $(0\ ,-4\ )$ **C.** $(0\ ,3\ )$ **D.** $(0\ ,-3\ )$

16. The result of $\lim_{x\to-\infty} \frac{3x}{4\,cosx - 2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

17. The result of $\lim_{x\to2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

18. The range of which of the following functions is $]-\infty,-2\ ]$?

A. $f(x) = -\sqrt{x} - 2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x} - 2$

19. In which interval is the function $f(x) = e^{x^3 - 6x^2 + 8}$ increasing ?

A. $]-\infty\ ,4\ [$ **B.** $]2\ ,4[$ **C.** $]0\ ,4[$ **D.** $]-\infty\ ,0\ [\cup]4\ ,+\infty[$

20. Redefine the function $f(x) = \frac{x^2 - 4x - 12}{x-6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 4 & x = 6 \end{cases}$ **B.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 12 & x = 6 \end{cases}$

C. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 8 & x = 6 \end{cases}$ **D.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ -2 & x = 6 \end{cases}$

21. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim_{\Delta x\to0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

22. If $3 - (\frac{1}{4}x - 1)^3 \leq f(x) \leq 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim_{x\to4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

23. Find the value of ($\boldsymbol{b}$) so that the points $(3\ ,-4\ )$, $(2\ ,\boldsymbol{b}\ )$ and $(1\ ,2\ )$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

24. The points of intersection of the functions $f(x) = x^2 + 2x$ *and* $g(x) = x + 2$. is

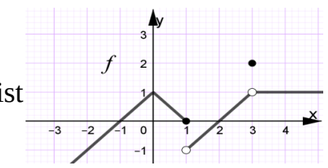
A. $\begin{cases}(1\ ,\ 3\ )\\(2\ ,\ 0\ )\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3\ )\\(2\ ,\ 0\ )\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3\ )\\(-2\ ,\ 0\ )\end{cases}$ **D.** $\begin{cases}(-1\ ,-1\ )\\(2\ ,\ 4\ )\end{cases}$

25. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

26. Use the given graph on the right to find the result of $\lim_{x\to3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



27. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

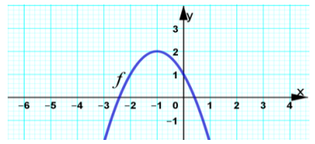
C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

28. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

29. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



30. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

31. At which value of x the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $x = -2$ **C.** $x = 6$ **D .** $x = -6$

32. Which of the following is false ?

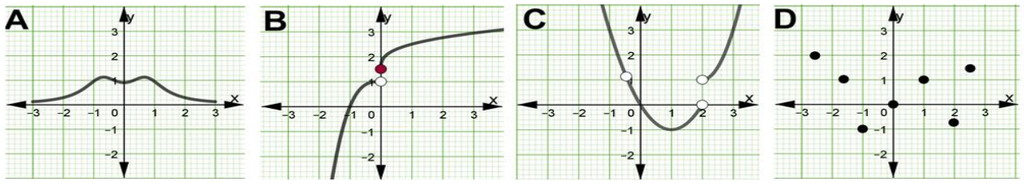
A. The distance between the point $(3, -7)$ and the line $y = 5$ is 12 .

B. The lines $3x + 4y = 10$ and $4x - 3y = 14$ are perpendicular .

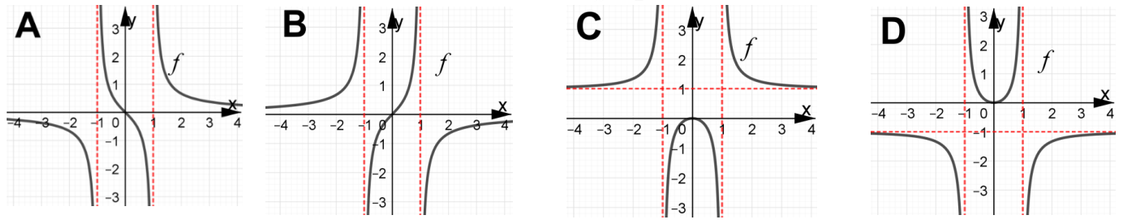
C. The domain of the function $f(x) = \frac{-2x}{3x-2}$ is $R - \left\{\frac{2}{3}\right\}$.

D. The graph of the function $f(x) = |x + 4|$ is symmetric with respect to the y −axis .

33. Which of the following graphs represents a one - to - one function?



34. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.



35. Find the value of (a) so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \geq 0 \end{cases}$

will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

36. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3 - 2x^2}{1 - 2x^3}$.

A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

37. Which of the following function is odd ?

A. $f(x) = 2x \sin x$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + \cos x$

38. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

39. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

A. $(0, 0)$ **B.** $(1, 2)$ **C.** $(0, 2)$ **D.** $(-1, 2)$

40. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

41. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

A. $y = \frac{-3}{4}x + 8$ **B.** $y = \frac{3}{4}x + 2$ **C.** $y = \frac{3}{4}x - 7$ **D.** $y = \frac{1}{4}x + 4$

42. Find the result of $\lim_{x \to 1} \frac{\sqrt{x} - 1}{1 - x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

43. The function $f(x) = \begin{cases} x & x < 1 \\ 2 & x = 1 \\ 2x - 1 & x > 1 \end{cases}$ is discontinuous at $x = 1$ because :

A. $f(1)$ is not defined. **B.** $\lim_{x \to 1} f(x)$ does not exist .

C. $\lim_{x \to 1} f(x) \neq f(1)$ **D.** $\lim_{x \to 1} f(x) = f(1)$

44. Which of the following functions achieves the behavior:

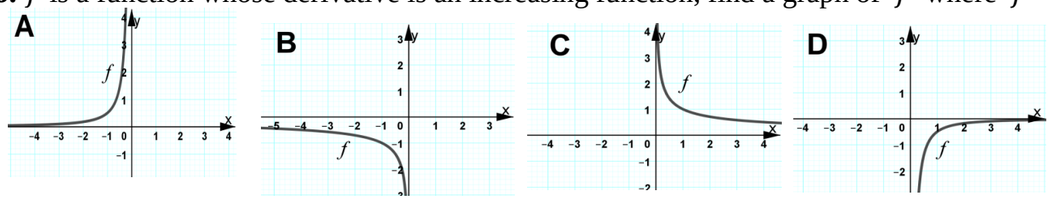
$f(x)$ tends to $+\infty$ as x tends to $-\infty$, $f(x)$ tends to $+\infty$ as x tends to $+\infty$

A. $f(x) = x^3 - 2x^2 + 1$ **B.** $f(x) = x^2 - 2x^3 + 1$

C. $f(x) = x^4 - 2x^3 + 1$ **D.** $f(x) = x^3 - 2x^4 + 1$

45. The result of $\lim_{x \to 3} \frac{2x^3 - 54}{3 - x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

46. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$



47. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

48. Find the critical value of the function $f(x) = x^3 + 6x - 5$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** *None*

49. Which of the following is true ?

A. $\lim_{x \to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim_{x \to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim_{x \to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D .** $\lim_{x \to 0} \frac{1 - \cos x}{\sin x} = 0$

50. The result of $\lim_{x \to 4} \frac{x^2 - 5x + 4}{x^2 - 2x - 8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

Kurdistan Region – Iraq 0003 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours **C** 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000003

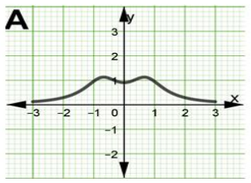
Answer the following questions : (two marks for each right choice)

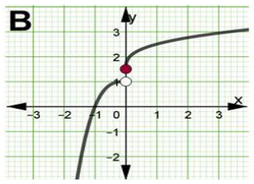
1. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

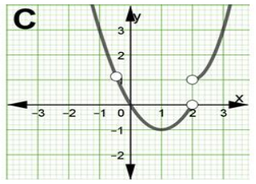
A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

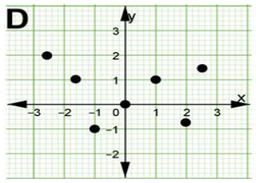
2. Find the result of $\lim\limits_{x\to1}\frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

3. Which of the following graphs represents a one - to - one function?

A 

B 

C 

D 

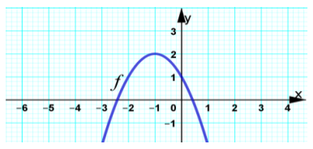
4. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x+y=-5$.

A. $y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

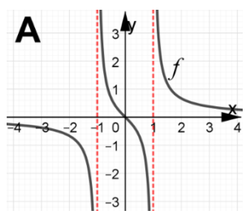
5. Which one is the function of the given graph?

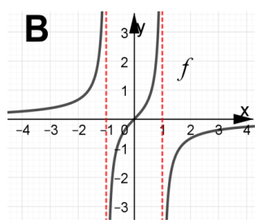
A. $f(x)=-(x+1)^2-2$ **B.** $f(x)=-(x+1)^2+2$

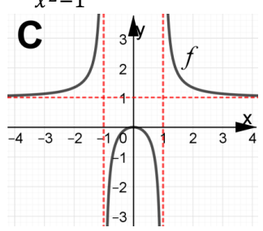
C. $f(x)=-(x-1)^2+2$ **D.** $f(x)=-(x-1)^2-2$

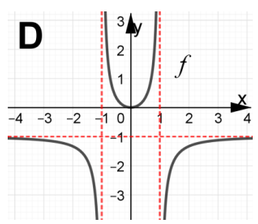


6. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x)=\frac{x}{x^2-1}$.

A 

B 

C 

D 

7. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

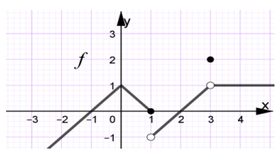
A. $f(x)=x^2-1$, $g(x)=2x-1$ **B.** $f(x)=1-x^2$, $g(x)=2x+1$

C. $f(x)=1-x$, $g(x)=2x^2+1$ **D.** $f(x)=2x+1$, $g(x)=x^2-1$

8. The result of $\lim\limits_{x\to3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

9. Use the given graph on the right to find the result of $\lim\limits_{x\to1^-}f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



10. The y –intercept of the line $y=-3x-4$ is :

A. $(0\ ,4\ )$ **B.** $(0\ ,-4\ )$ **C.** $(0\ ,3\ )$ **D.** $(0\ ,-3\ )$

11. The function $f(x)=\begin{cases}x & x<1\\ 2 & x=1\\ 2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to1}f(x)$ does not exist .

C. $\lim\limits_{x\to1}f(x)\neq f(1)$ **D.** $\lim\limits_{x\to1}f(x)=f(1)$

12. Find the equation of the line that passes through the points $(2\ ,0)$ and $(0\ ,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

13. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

14. The result of $\lim\limits_{x\to4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

15. Which of the following function is odd ?

A. $f(x)=2x\ sinx$ **B.** $f(x)=\frac{3}{x^2}$ **C.** $f(x)=\frac{x}{|x|}$ **D.** $f(x)=x+cosx$

16. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to-\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to+\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$

C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

17. The range of which of the following functions is $]-\infty,-2\ ]$?

A. $f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.** $f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

18. Find the domain of the function $f(x)=-\sqrt{x^2-3x-10}$.

A. $[-2\ ,5\ ]$ **B.** $]-\infty,-2\ ]\cup[5\ ,+\infty[$ **C.** $[-5\ ,2\ ]$ **D.** $]-\infty,-5\ ]\cup[2\ ,+\infty[$

19. Which of the following is false ?

A. The distance between the point $(\ \mathbf{3}\ ,\mathbf{-7}\ )$ and the line $\boldsymbol{y=5}$ is **12** .

B. The lines $\boldsymbol{3x+4y=10}$ and $\boldsymbol{4x-3y=14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x)=\frac{-2x}{3x-2}}$ is $\boldsymbol{R-\left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x)=|x+4|}$ is symmetric with respect to the y –axis .

20. Find the rate of change of the distance between a particle moving on the parabola $y=x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt}=2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

21. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.** $\boldsymbol{x=-2}$ **C.** $x=6$ **D .** $x=-6$

22. Which of the following is true ?

A. $\lim\limits_{x\to1^+}\frac{-3}{(x-1)^2}=+\infty$ **B.** $\lim\limits_{x\to0}\frac{\frac{1}{3+x}-\frac{1}{3}}{x}=\frac{1}{9}$ **C.** $\lim\limits_{x\to0}\frac{\sin3x}{\sin2x}=\frac{2}{3}$ **D .** $\lim\limits_{x\to0}\frac{1-cosx}{sinx}=0$

23. Determine the table of the function $f(x)=C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

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x	-4	-1	0	1	4
y	6	3	0	3	6

24. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.**-5 **B.** 5 **C.**-3 **D.** 3) (m/sec)

25. Find the value of ($\boldsymbol{b}$) so that the points $(3\,,-4\,)$, $(2\,,\boldsymbol{b}\,)$ and $(1\,,2\,)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

26. Find the value of $(\boldsymbol{a})$ so that the function $f(x)=\begin{cases} x^3+\frac{1}{2} & x<0 \\ 4(x^2+a) & x\geq 0 \end{cases}$

will be continuous at $x=0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

27. If $3-(\frac{1}{4}x-1)^3\leq f(x)\leq 3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

28. Find the derivative of the function $f(x)=\frac{x}{\sqrt{x^4+1}}$.

A. $f'(x)=\frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x)=\frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x)=\frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x)=\frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

29. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

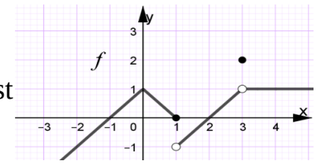
A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

30. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A. x^2-3x+4 **B.** x^2+x-8 **C.** x^2+x **D.** $2x-3$

31. Use the given graph on the right to find the result of $\lim\limits_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



32. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x})=3$ **B.** $\frac{d}{dx}(\,\pi^2-3)=2\pi$ **C.** $\lim\limits_{x\to-\infty}\frac{\sqrt{x^2+x}}{-2\,x}=\frac{1}{2}$ **D.** $\lim\limits_{x\to 1^-}\frac{3}{1-x}=+\infty$

33. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

34. Find the derivative of the function $f(x)=\ln x^2$.

A. $f'(x)=\frac{1}{2\,x}$ **B.** $f'(x)=\frac{2}{x}$ **C.** $f'(x)=\frac{1}{x}$ **D.** $f'(x)=2\ln x$

35. If $f(x)=a\,x^3+x$ find the value of $\boldsymbol{a}$ where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

36. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

37. Find the horizontal asymptote to the graph of a function $f(x)=\frac{5x^3-2x^2}{1-2x^3}$.

A. $y=\frac{5}{2}$ **B.** $y=-\frac{5}{2}$ **C.** $y=\frac{3}{2}$ **D.** $y=-\frac{3}{2}$

38. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 12 & x=6\end{cases}$

C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ -2 & x=6\end{cases}$

39. In which interval is the function $f(x)=e^{\,x^3-6\,x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.** $]-\infty\,,0\,[\cup\,]4\,,+\infty[$

40. The points of intersection of the functions $f(x)=x^2+2x$ *and* $g(x)=x+2$. is

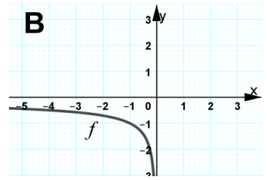
A. $\begin{cases}(1\ ,\ 3\ )\\(2\ ,\ 0\ )\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3\ )\\(2\ ,\ 0\ )\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3\ )\\(-2\ ,\ 0\ )\end{cases}$ **D.** $\begin{cases}(-1\,,-1\,)\\(\ 2\ ,\ 4\ )\end{cases}$

41. Find the result of $\lim\limits_{x\to 0}\frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

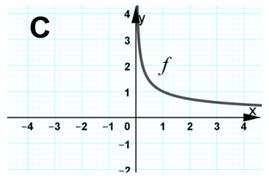
42. f is a function whose derivative is an increasing function, find a graph of f where $f'<0$

A

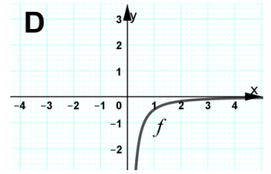
B



C



D



43. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between $\boldsymbol{-2}$ and $\boldsymbol{0}$.

A. $f(x)=\frac{x-1}{x+1}$ **B.** $f(x)=x^2-3x+2$

C. $f(x)=2x^2+3x-3$ **D.** $f(x)=2x^3-2x+1$

44. The result of $\lim\limits_{x\to 2}\frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

45. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

46. If $f(x)=\frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to 0}\frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

47. Find the critical value of the function $\boldsymbol{f(x)=x^3+6x-5}$

A. $x=-1$ **B.** $x=1$ **C.** $x=2$ **D.** *None*

48. The result of $\lim\limits_{x\to-\infty}\frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

49. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

50. Find the second derivative of the function $f(x)=x\,sinx+cosx$.

A. $f''(x)=-x\,sinx+cosx$ **B.** $f''(x)=x\,cosx+2sinx$

C. $f''(x)=-x\,cosx+sinx$ **D.** $f''(x)=x\,sinx-2cosx$

Kurdistan Region – Iraq 0004 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours **D** 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000004

Answer the following questions : (two marks for each right choice)

1. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

2. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x)=x^2-1$, $g(x)=2x-1$ **B.** $f(x)=1-x^2$, $g(x)=2x+1$

C. $f(x)=1-x$, $g(x)=2x^2+1$ **D.** $f(x)=2x+1$, $g(x)=x^2-1$

3. The result of $\lim\limits_{x\to3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

4. Find the critical value of the function $\boldsymbol{f(x)=x^3+6x-5}$

A. $x=-1$ **B.** $x=1$ **C.** $x=2$ **D.** $None$

5. Find the result of $\lim\limits_{x\to1}\frac{\sqrt{x}-1}{1-x}$: **A.** $\boldsymbol{-1}$ **B.** $\boldsymbol{1}$ **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

6. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 12 & x=6\end{cases}$

C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ -2 & x=6\end{cases}$

7. Which of the following is false ?

A. The distance between the point (**3** , -7) and the line $\boldsymbol{y=5}$ is **12** .

B. The lines $\boldsymbol{3x+4y=10}$ and $\boldsymbol{4x-3y=14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x)=\frac{-2x}{3x-2}}$ is $\boldsymbol{R-\left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x)=|x+4|}$ is symmetric with respect to the y −axis .

8. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.**-5 **B.** 5 **C.**-3 **D.** 3) (m/sec)

9. Find the domain of the function $f(x)=-\sqrt{x^2-3x-10}$.

A.$[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

10. Which of the following is true ?

A. $\lim\limits_{x\to1^+}\frac{-3}{(x-1)^2}=+\infty$ **B.** $\lim\limits_{x\to0}\frac{\frac{1}{3+x}-\frac{1}{3}}{x}=\frac{1}{9}$ **C.** $\lim\limits_{x\to0}\frac{\sin3x}{\sin2x}=\frac{2}{3}$ **D** .$\lim\limits_{x\to0}\frac{1-cosx}{sinx}=0$

11. In which interval is the function $f(x)=e^{\,x^3-6\,x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.**$]-\infty\,,0\,[\cup]4\,,+\infty[$

12. The function $f(x)=\begin{cases}x & x<1\\ 2 & x=1\\ 2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to1}f(x)$ does not exist .

C. $\lim\limits_{x\to1}f(x)\neq f(1)$ **D.** $\lim\limits_{x\to1}f(x)=f(1)$

13. Find the value of ($\boldsymbol{b}$) so that the points $(3\,,-4\,)$, $(2\,,\boldsymbol{b}\,)$ and $(1\,,2\,)$ are collinear .

A.-1 **B.** 1 **C.**-2 **D.** 4

14. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

15. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.**$-\sqrt{3}$ **C.** 1 **D.** -1

16. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

17. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.**$\boldsymbol{x=-2}$ **C.** $x=6$ **D .** $x=-6$

18. Find the derivative of the function $f(x)=\frac{x}{\sqrt{x^4+1}}$.

A. $f'(x)=\frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x)=\frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x)=\frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x)=\frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

19. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x})=3$ **B.** $\frac{d}{dx}(\,\pi^2-3)=2\pi$ **C.** $\lim\limits_{x\to-\infty}\frac{\sqrt{x^2+x}}{-2\,x}=\frac{1}{2}$ **D.** $\lim\limits_{x\to1^-}\frac{3}{1-x}=+\infty$

20. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A.x^2-3x+4 **B.**x^2+x-8 **C.**x^2+x **D.** $2x-3$

21. Find the second derivative of the function $f(x)=x\,sinx+cosx$.

A. $f''(x)=-x\,sinx+cosx$ **B.** $f''(x)=x\,cosx+2sinx$

C. $f''(x)=-x\,cosx+sinx$ **D.** $f''(x)=x\,sinx-2cosx$

22. Find the derivative of the function $f(x)=\ln x^2$.

A.$f'(x)=\frac{1}{2\,x}$ **B.** $f'(x)=\frac{2}{x}$ **C.**$f'(x)=\frac{1}{x}$ **D.** $f'(x)=2\ln x$

23. The range of which of the following functions is $]-\infty,-2\,]$?

A.$f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.**$f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

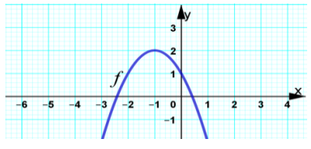
24. Find the equation of the line that passes through the point $(-2\,,5)$ and that is parallel to the line $3x+y=-5$.

A.$y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

25. Which one is the function of the given graph?

A.$f(x)=-(x+1)^2-2$ **B.** $f(x)=-(x+1)^2+2$

C. $f(x)=-(x-1)^2+2$ **D.** $f(x)=-(x-1)^2-2$



26. If $f(x)=a\,x^3+x$ find the value of $\boldsymbol{a}$ where $f'(2)=13$.

A. 2 **B.**-2 **C.**-1 **D.** 1

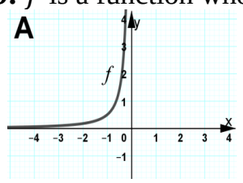
27. Which of the following function is odd ?

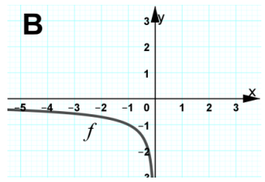
A. $f(x) = 2x\ sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

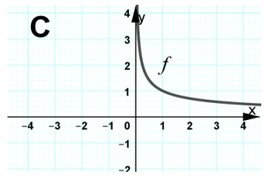
28. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3 - 2x^2}{1 - 2x^3}$.

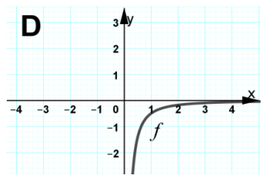
A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

29. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

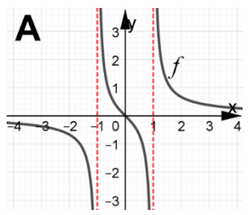
A 

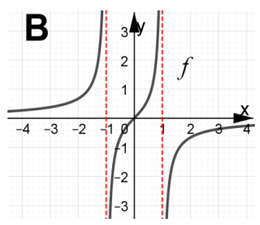
B 

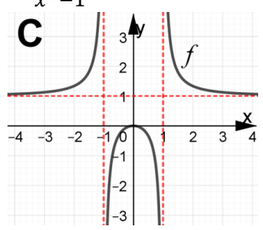
C 

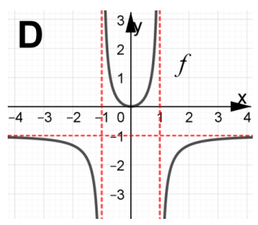
D 

30. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2 - 1}$.

A 

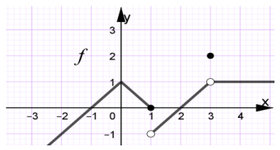
B 

C 

D 

31. Use the given graph on the right to find the result of $\lim_{x \to 1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



32. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

33. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between -2 and 0 .

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

34. The points of intersection of the functions $f(x) = x^2 + 2x\ and\ g(x) = x + 2$. is

A. $\begin{cases}(1\ ,\ 3\ )\\(2\ ,\ 0\ )\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3\ )\\(2\ ,\ 0\ )\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3\ )\\(-2\ ,\ 0\ )\end{cases}$ **D.** $\begin{cases}(-1\ ,-1\ )\\(2\ ,\ 4\ )\end{cases}$

35. Find the value of (a) so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \geq 0 \end{cases}$

will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D** . $\frac{1}{8}$

36. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

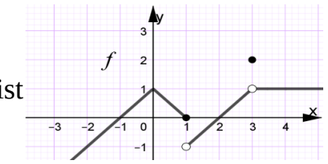
A. $(0\ ,0)$ **B.** $(1\ ,2)$ **C.** $(0\ ,2)$ **D.** $(-1\ ,2)$

37. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim_{\Delta x \to 0} \frac{f(2+\Delta x) - f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

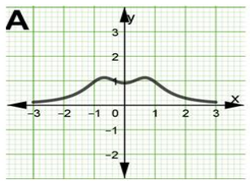
38. If $3 - (\frac{1}{4}x - 1)^3 \leq f(x) \leq 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim_{x \to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

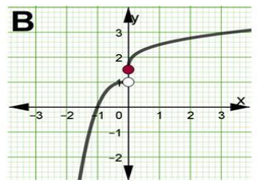
39. Use the given graph on the right to find the result of $\lim_{x \to 3} f(x)$

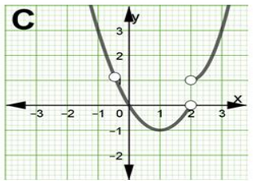
A. 1 **B.** 0 **C.** 2 **D.** Does not exist

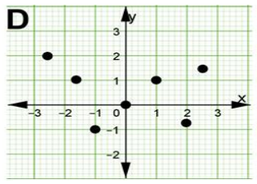


40. Which of the following graphs represents a one - to - one function?

A 

B 

C 

D 

41. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x) = x^3 - 2x^2 + 1$ **B.** $f(x) = x^2 - 2x^3 + 1$

C. $f(x) = x^4 - 2x^3 + 1$ **D.** $f(x) = x^3 - 2x^4 + 1$

42. The result of $\lim_{x \to -\infty} \frac{3x}{4\ cosx - 2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

43. The result of $\lim_{x \to 4} \frac{x^2 - 5x + 4}{x^2 - 2x - 8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

44. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2 + 2x - 1}{x - 2}$ is :

A. $y = 3x + 8$ **B.** $y = 3x - 8$ **C.** $y = x + 3$ **D.** $y = x - 3$

45. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

46. The y –intercept of the line $y = -3x - 4$ is :

A. $(0\ ,4\ )$ **B.** $(0\ ,-4\ )$ **C.** $(0\ ,3\ )$ **D.** $(0\ ,-3\ )$

47. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 m^2 B. 850 m^2 C. 784 m^2 D. 824 m^2

48. Find the result of $\lim_{x \to 0} \frac{e^x - 1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

49. Find the equation of the line that passes through the points $(2\ ,0)$ and $(0\ ,-3)$

A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

50. The result of $\lim_{x \to 2} \frac{\sqrt{6-x} - 2}{x - 2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

Kurdistan Region – Iraq 0005 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours **E** 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000005

Answer the following questions : (two marks for each right choice)

1. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , t is measured in seconds and S in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

2. The range of which of the following functions is $]-\infty, -2\,]$?

A. $f(x) = -\sqrt{x} - 2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x} - 2$

3. Find the equation of the line that passes through the points $(2\,, 0)$ and $(0\,, -3)$

A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

4. The result of $\lim\limits_{x\to-\infty} \frac{3x}{4\cos x - 2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

5. Find the value of (b) so that the points $(3\,, -4\,)$, $(2\,, b\,)$ and $(1\,, 2\,)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

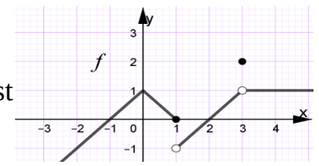
6. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ln x$

7. If $3 - (\frac{1}{4}x - 1)^3 \le f(x) \le 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

8. Use the given graph on the right to find the result of $\lim\limits_{x\to3} f(x)$

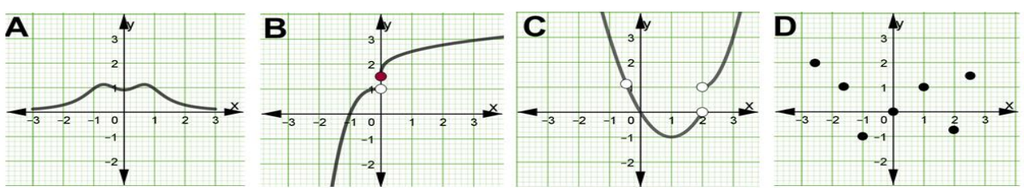
A. 1 **B.** 0 **C.** 2 **D.** Does not exist



9. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 m^2 B. 850 m^2 C. 784 m^2 D. 824 m^2

10. Which of the following graphs represents a one - to - one function?

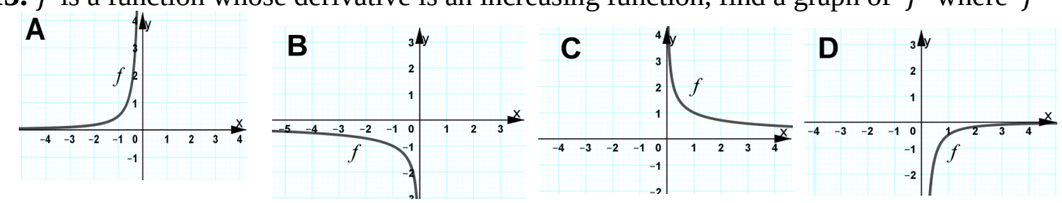


11. At which value of x the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $x = -2$ **C.** $x = 6$ **D .** $x = -6$

12. The points of intersection of the functions $f(x) = x^2 + 2x$ *and* $g(x) = x + 2$. is

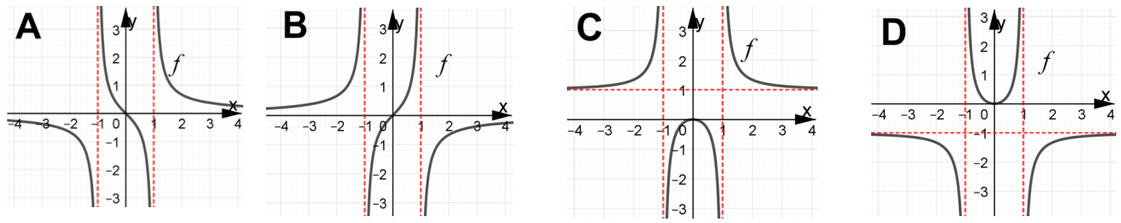
A. $\begin{cases}(1\ ,\ 3\,)\\(2\ ,\ 0\,)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3\,)\\(2\ ,\ 0\,)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3\,)\\(-2\ ,\ 0\,)\end{cases}$ **D.** $\begin{cases}(-1\,,-1\,)\\(2\ ,\ 4\,)\end{cases}$

13. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$



14. Find the value of (a) so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \ge 0 \end{cases}$ will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

15. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.



16. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

17. Find the equation of the line that passes through the point $(-2\ , 5)$ and that is parallel to the line $3x + y = -5$.

A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

18. Which of the following is false ?

A. The distance between the point ($\mathbf{3}\,, \mathbf{-7}$) and the line $\boldsymbol{y = 5}$ is **12** .

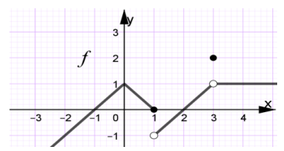
B. The lines $\boldsymbol{3x + 4y = 10}$ and $\boldsymbol{4x - 3y = 14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x) = \frac{-2x}{3x-2}}$ is $\boldsymbol{R - \left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x) = |x + 4|}$ is symmetric with respect to the y −axis .

19. Use the given graph on the right to find the result of $\lim\limits_{x\to1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



20. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

21. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

22. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

23. Which of the following function is odd ?

A. $f(x) = 2x\ sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

24. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2, 5]$ **B.** $]-\infty, -2] \cup [5, +\infty[$ **C.** $[-5, 2]$ **D.** $]-\infty, -5] \cup [2, +\infty[$

25. Redefine the function $f(x) = \frac{x^2-4x-12}{x-6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 4 & x = 6 \end{cases}$ **B.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 12 & x = 6 \end{cases}$

C. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 8 & x = 6 \end{cases}$ **D.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ -2 & x = 6 \end{cases}$

26. The result of $\lim_{x\to 3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

27. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

28. If $f(x) = a\,x^3 + x$ find the value of a where $f'(2) = 13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

29. The function $f(x) = \begin{cases} x & x < 1 \\ 2 & x = 1 \\ 2x - 1 & x > 1 \end{cases}$ is discontinuous at $x = 1$ because :

A. $f(1)$ is not defined. **B.** $\lim_{x\to 1} f(x)$ does not exist .

C. $\lim_{x\to 1} f(x) \neq f(1)$ **D.** $\lim_{x\to 1} f(x) = f(1)$

30. Find the result of $\lim_{x\to 0} \frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

31. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim_{x\to 1^-} \frac{3}{1-x} = +\infty$

32. The result of $\lim_{x\to 4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

33. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

34. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x) = x^3 - 2x^2 + 1$ **B.** $f(x) = x^2 - 2x^3 + 1$

C. $f(x) = x^4 - 2x^3 + 1$ **D.** $f(x) = x^3 - 2x^4 + 1$

35. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

36. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim_{\Delta x\to 0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

37. Find the result of $\lim_{x\to 1} \frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

38. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3-2x^2}{1-2x^3}$.

A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

39. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

40. The y –intercept of the line $y = -3x - 4$ is :

A. $(0, 4)$ **B.** $(0, -4)$ **C.** $(0, 3)$ **D.** $(0, -3)$

41. Which of the following is true ?

A. $\lim_{x\to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim_{x\to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim_{x\to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D .** $\lim_{x\to 0} \frac{1-cosx}{sinx} = 0$

42. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between -2 and 0 .

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

43. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

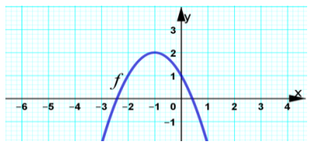
A. $(0, 0)$ **B.** $(1, 2)$ **C.** $(0, 2)$ **D.** $(-1, 2)$

44. The result of $\lim_{x\to 2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

45. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



46. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :

A. $y = 3x + 8$ **B.** $y = 3x - 8$ **C.** $y = x + 3$ **D.** $y = x - 3$

47. Find the critical value of the function $\boldsymbol{f(x) = x^3 + 6x - 5}$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

48. In which interval is the function $f(x) = e^{x^3-6x^2+8}$ increasing ?

A. $]-\infty, 4[$ **B.** $]2, 4[$ **C.** $]0, 4[$ **D.** $]-\infty, 0[\cup]4, +\infty[$

49. Find the second derivative of the function $f(x) = x\ sinx + cosx$.

A. $f''(x) = -x\ sinx + cosx$ **B.** $f''(x) = x\ cosx + 2sinx$

C. $f''(x) = -x\ cosx + sinx$ **D.** $f''(x) = x\ sinx - 2cosx$

50. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

A. $y = \frac{-3}{4}x + 8$ **B.** $y = \frac{3}{4}x + 2$ **C.** $y = \frac{3}{4}x - 7$ **D.** $y = \frac{1}{4}x + 4$

Kurdistan Region – Iraq 0006 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours **F** 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000006

Answer the following questions : (two marks for each right choice)

1. If $3-(\frac{1}{4}x-1)^3 \le f(x) \le 3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

2. The function $f(x)=\begin{cases} x & x<1 \\ 2 & x=1 \\ 2x-1 & x>1 \end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to 1} f(x)$ does not exist .

C. $\lim\limits_{x\to 1} f(x) \neq f(1)$ **D.** $\lim\limits_{x\to 1} f(x) = f(1)$

3. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A. x^2-3x+4 **B.** x^2+x-8 **C.** x^2+x **D.** $2x-3$

4. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between -2 and 0 .

A. $f(x)=\frac{x-1}{x+1}$ **B.** $f(x)=x^2-3x+2$

C. $f(x)=2x^2+3x-3$ **D.** $f(x)=2x^3-2x+1$

5. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

6. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x})=3$ **B.** $\frac{d}{dx}(\pi^2-3)=2\pi$ **C.** $\lim\limits_{x\to-\infty}\frac{\sqrt{x^2+x}}{-2x}=\frac{1}{2}$ **D.** $\lim\limits_{x\to 1^-}\frac{3}{1-x}=+\infty$

7. The range of which of the following functions is $]-\infty,-2\,]$?

A. $f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.** $f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

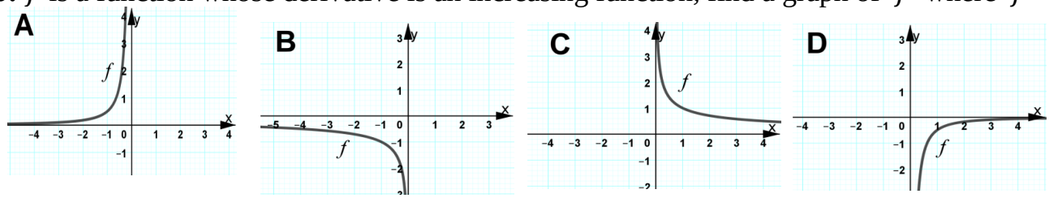
8. Which of the following function is odd ?

A. $f(x)=2x\,sinx$ **B.** $f(x)=\frac{3}{x^2}$ **C.** $f(x)=\frac{x}{|x|}$ **D.** $f(x)=x+cosx$

9. Find the value of (a) so that the function $f(x)=\begin{cases} x^3+\frac{1}{2} & x<0 \\ 4(x^2+a) & x\ge 0 \end{cases}$

will be continuous at $x=0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D.** $\frac{1}{8}$

10. f is a function whose derivative is an increasing function, find a graph of f where $f'<0$



11. Find the result of $\lim\limits_{x\to 1}\frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

12. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

13. Determine the table of the function $f(x)=C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

14. Which of the following is true ?

A. $\lim\limits_{x\to 1^+}\frac{-3}{(x-1)^2}=+\infty$ **B.** $\lim\limits_{x\to 0}\frac{\frac{1}{3+x}-\frac{1}{3}}{x}=\frac{1}{9}$ **C.** $\lim\limits_{x\to 0}\frac{\sin 3x}{\sin 2x}=\frac{2}{3}$ **D .** $\lim\limits_{x\to 0}\frac{1-cosx}{sinx}=0$

15. Find the critical value of the function $f(x)=x^3+6x-5$

A. $x=-1$ **B.** $x=1$ **C.** $x=2$ **D.** $None$

16. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

17. Find the rate of change of the distance between a particle moving on the parabola $y=x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt}=2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

18. Find the domain of the function $f(x)=-\sqrt{x^2-3x-10}$.

A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

19. Find the derivative of the function $f(x)=\frac{x}{\sqrt{x^4+1}}$.

A. $f'(x)=\frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x)=\frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x)=\frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x)=\frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

20. The result of $\lim\limits_{x\to 4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

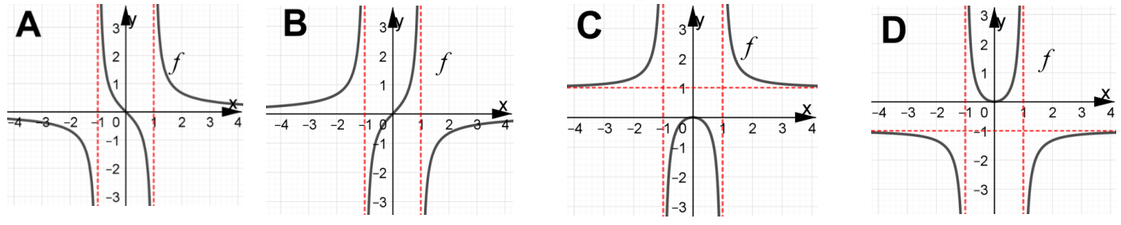
21. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x)=x^2-1$, $g(x)=2x-1$ **B.** $f(x)=1-x^2$, $g(x)=2x+1$

C. $f(x)=1-x$, $g(x)=2x^2+1$ **D.** $f(x)=2x+1$, $g(x)=x^2-1$

22. The result of $\lim\limits_{x\to-\infty}\frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

23. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x)=\frac{x}{x^2-1}$.



24. In which interval is the function $f(x)=e^{x^3-6x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.** $]-\infty\,,0\,[\cup]4\,,+\infty[$

25. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

26. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 m^2 B. 850 m^2 C. 784 m^2 D. 824 m^2

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$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$
C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

28. Which of the following is false ?

A. The distance between the point $(3,-7)$ and the line $y=5$ is 12 .

B. The lines $3x+4y=10$ and $4x-3y=14$ are perpendicular .

C. The domain of the function $f(x)=\frac{-2x}{3x-2}$ is $R-\left\{\frac{2}{3}\right\}$.

D. The graph of the function $f(x)=|x+4|$ is symmetric with respect to the y −axis .

29. The result of $\lim_{x\to 2}\frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

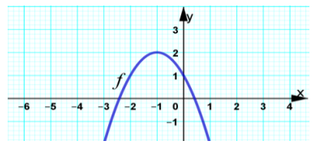
30. Find the value of (b) so that the points $(3,-4)$, $(2,b)$ and $(1,2)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

31. Which one is the function of the given graph?

A. $f(x)=-(x+1)^2-2$ **B.** $f(x)=-(x+1)^2+2$

C. $f(x)=-(x-1)^2+2$ **D.** $f(x)=-(x-1)^2-2$



32. Find the equation of the line that passes through the point $(-2,5)$ and that is parallel to the line $3x+y=-5$.

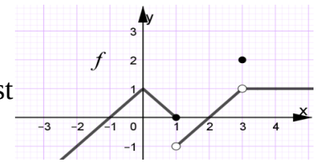
A. $y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

33. The y –intercept of the line $y=-3x-4$ is :

A. $(0,4)$ **B.** $(0,-4)$ **C.** $(0,3)$ **D.** $(0,-3)$

34. Use the given graph on the right to find the result of $\lim_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



35. The points of intersection of the functions $f(x)=x^2+2x\ and\ g(x)=x+2.$ is

A. $\begin{cases}(1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\(-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\ ,-1)\\(2\ ,\ 4)\end{cases}$

36. Find the horizontal asymptote to the graph of a function $f(x)=\frac{5x^3-2x^2}{1-2x^3}$.

A. $y=\frac{5}{2}$ **B.** $y=-\frac{5}{2}$ **C.** $y=\frac{3}{2}$ **D.** $y=-\frac{3}{2}$

37. Find the result of $\lim_{x\to 0}\frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

38. Find the derivative of the function $f(x)=\ln x^2$.

A. $f'(x)=\frac{1}{2x}$ **B.** $f'(x)=\frac{2}{x}$ **C.** $f'(x)=\frac{1}{x}$ **D.** $f'(x)=2\ln x$

39. If $f(x)=a\,x^3+x$ find the value of a where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

40. Find the second derivative of the function $f(x)=x\,sinx+cosx$.

A. $f''(x)=-x\,sinx+cosx$ **B.** $f''(x)=x\,cosx+2sinx$

C. $f''(x)=-x\,cosx+sinx$ **D.** $f''(x)=x\,sinx-2cosx$

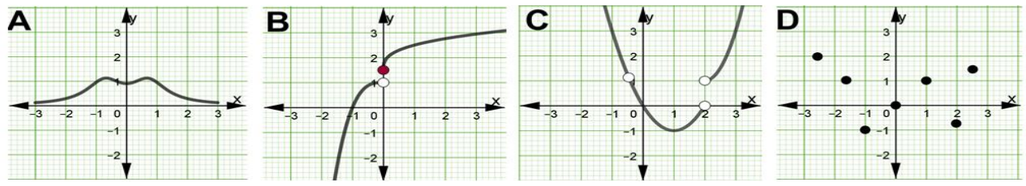
41. At which value of x the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.** $x=-2$ **C.** $x=6$ **D .** $x=-6$

42. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

43. If $f(x)=\frac{-4}{5-x}$ then the result of $\lim_{\Delta x\to 0}\frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

44. Which of the following graphs represents a one - to - one function?



45. The result of $\lim_{x\to 3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

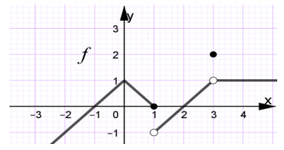
46. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 12 & x=6\end{cases}$

C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ -2 & x=6\end{cases}$

47. Use the given graph on the right to find the result of $\lim_{x\to 1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



48. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , t is measured in seconds and S in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

49. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

50. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

Kurdistan Region – Iraq 0007 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours G

71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000007

Answer the following questions : (two marks for each right choice)

1. The result of $\lim\limits_{x\to 3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

2. Find the domain of the function $f(x) = -\sqrt{x^2-3x-10}$.

A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

3. Which of the following is true ?

A. $\lim\limits_{x\to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim\limits_{x\to 0} \frac{\frac{1}{3+x}-\frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim\limits_{x\to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D** . $\lim\limits_{x\to 0} \frac{1-cosx}{sinx} = 0$

4. In which interval is the function $f(x) = e^{\,x^3-6\,x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.** $]-\infty\,,0\,[\cup\,]4\,,+\infty[$

5. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between $-\mathbf{2}$ and $\mathbf{0}$.

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2-3x+2$

C. $f(x) = 2x^2+3x-3$ **D.** $f(x) = 2x^3-2x+1$

6. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :

A. $y = 3x+8$ **B.** $y = 3x-8$ **C.** $y = x+3$ **D.** $y = x-3$

7. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3-2x^2}{1-2x^3}$.

A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

8. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

A. $y = \frac{-3}{4}x+8$ **B.** $y = \frac{3}{4}x+2$ **C.** $y = \frac{3}{4}x-7$ **D.** $y = \frac{1}{4}x+4$

9. If $3-(\frac{1}{4}x-1)^3 \le f(x) \le 3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

10. Find the value of $(\boldsymbol{a})$ so that the function $f(x) = \begin{cases} x^3+\frac{1}{2} & x<0 \\ 4(x^2+a) & x\ge 0 \end{cases}$

will be continuous at $x=0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D** . $\frac{1}{8}$

11. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

12. The y –intercept of the line $y = -3x-4$ is :

A. $(0\,,4\,)$ **B.** $(0\,,-4\,)$ **C.** $(0\,,3\,)$ **D.** $(0\,,-3\,)$

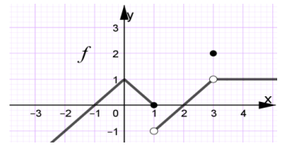
13. Which of the following function is odd ?

A. $f(x) = 2x\,sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|\,x\,|}$ **D.** $f(x) = x+cosx$

14. The result of $\lim\limits_{x\to 4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

15. Use the given graph on the right to find the result of $\lim\limits_{x\to 1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .

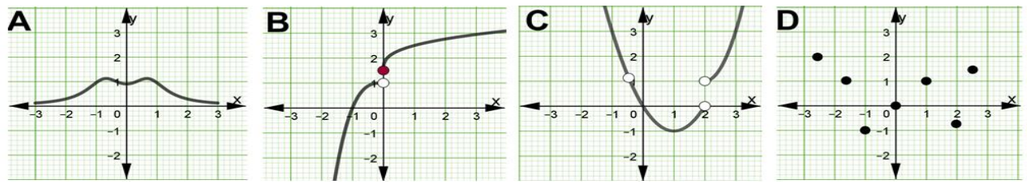


16. The result of $\lim\limits_{x\to -\infty} \frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

17. If $f(x) = a\,x^3+x$ find the value of $\boldsymbol{a}$ where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

18. Which of the following graphs represents a one - to - one function?



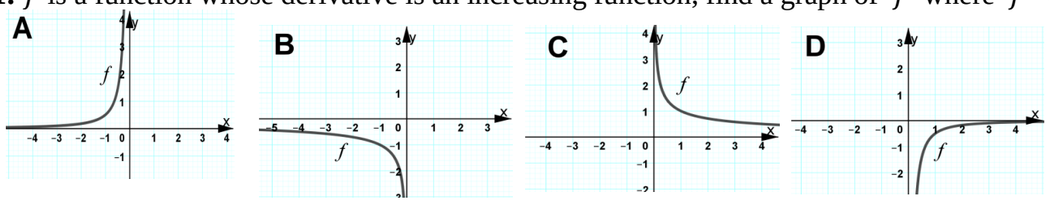
19. Find the point of inflection for the function $f(x) = x^3-x+2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

20. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

21. f is a function whose derivative is an increasing function, find a graph of f where $f'<0$



22. The range of which of the following functions is $]-\infty,-2\,]$?

A. $f(x) = -\sqrt{x}-2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x}-2$

23. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x) = x^3-2x^2+1$ **B.** $f(x) = x^2-2x^3+1$

C. $f(x) = x^4-2x^3+1$ **D.** $f(x) = x^3-2x^4+1$

24. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2-1$, $g(x) = 2x-1$ **B.** $f(x) = 1-x^2$, $g(x) = 2x+1$

C. $f(x) = 1-x$, $g(x) = 2x^2+1$ **D.** $f(x) = 2x+1$, $g(x) = x^2-1$

25. The function $f(x) = \begin{cases} x & x<1 \\ 2 & x=1 \\ 2x-1 & x>1 \end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to 1} f(x)$ does not exist .

C. $\lim\limits_{x\to 1} f(x) \ne f(1)$ **D.** $\lim\limits_{x\to 1} f(x) = f(1)$

26. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

27. Redefine the function $f(x) = \frac{x^2-4x-12}{x-6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 4 & x = 6 \end{cases}$ **B.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 12 & x = 6 \end{cases}$

C. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 8 & x = 6 \end{cases}$ **D.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ -2 & x = 6 \end{cases}$

28. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

29. Which of the following is false ?

A. The distance between the point $(\mathbf{3}, -\mathbf{7})$ and the line $\boldsymbol{y = 5}$ is $\mathbf{12}$.

B. The lines $\mathbf{3x + 4y = 10}$ and $\mathbf{4x - 3y = 14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x) = \frac{-2x}{3x-2}}$ is $\boldsymbol{R - \left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x) = |x + 4|}$ is symmetric with respect to the $y-$axis .

30. Find the value of ($\boldsymbol{b}$) so that the points $(3, -4)$, $(2, \boldsymbol{b})$ and $(1, 2)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

31. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

32. The result of $\lim\limits_{x\to 2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

33. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

34. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

35. Find the second derivative of the function $f(x) = x\ sinx + cosx$.

A. $f''(x) = -x\ sinx + cosx$ **B.** $f''(x) = x\ cosx + 2sinx$

C. $f''(x) = -x\ cosx + sinx$ **D.** $f''(x) = x\ sinx - 2cosx$

36. Which of the following is false ?

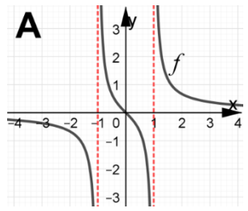
A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim\limits_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim\limits_{x\to 1^-} \frac{3}{1-x} = +\infty$

37. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

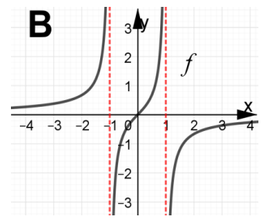
A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

38. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.

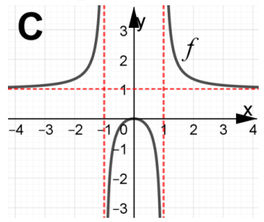
A



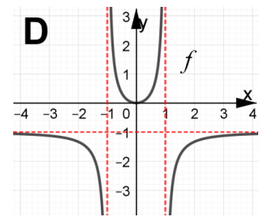
B



C



D

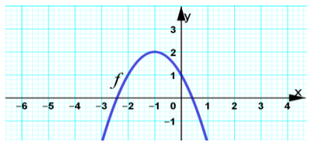


39. Find the result of $\lim\limits_{x\to 1} \frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

40. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



41. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

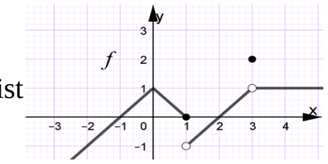
D

x	-4	-1	0	1	4
y	6	3	0	3	6

42. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to 0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

43. Use the given graph on the right to find the result of $\lim\limits_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



44. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ \ln x$

45. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $\boldsymbol{x} = -2$ **C.** $x = 6$ **D .** $x = -6$

46. Find the critical value of the function $\boldsymbol{f(x) = x^3 + 6x - 5}$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

47. The points of intersection of the functions $f(x) = x^2 + 2x\ and\ g(x) = x + 2.$ is

A. $\begin{cases} (1\ ,\ 3) \\ (2\ ,\ 0) \end{cases}$ **B.** $\begin{cases} (-1\ ,\ 3) \\ (2\ ,\ 0) \end{cases}$ **C.** $\begin{cases} (1\ ,\ 3) \\ (-2\ ,\ 0) \end{cases}$ **D.** $\begin{cases} (-1\ ,-1) \\ (2\ ,\ 4) \end{cases}$

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A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

49. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

50. Find the result of $\lim\limits_{x\to 0} \frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

Kurdistan Region – Iraq 0008 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours **H** 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000008

Answer the following questions : (two marks for each right choice)

1. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ln x$

2. Find the result of $\lim_{x\to 0} \frac{e^x - 1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

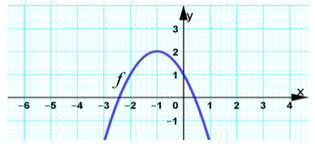
3. Find the equation of the line that passes through the point $(-2\ , 5)$ and that is parallel to the line $3x + y = -5$.

A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

4. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$

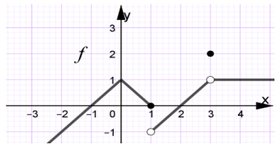


5. The y –intercept of the line $y = -3x - 4$ is :

A. $(0\ , 4)$ **B.** $(0\ , -4)$ **C.** $(0\ , 3)$ **D.** $(0\ , -3)$

6. Use the given graph on the right to find the result of $\lim_{x\to 1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



7. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

8. If $f(x) = a\,x^3 + x$ find the value of $\boldsymbol{a}$ where $f'(2) = 13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

9. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

10. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3-2x^2}{1-2x^3}$.

A. y = $\frac{5}{2}$ **B.** y = $-\frac{5}{2}$ **C.** y = $\frac{3}{2}$ **D.** y = $-\frac{3}{2}$

11. Which of the following is false ?

A. The distance between the point $(\mathbf{3}\ , \mathbf{-7})$ and the line $\boldsymbol{y = 5}$ is **12** .

B. The lines $\boldsymbol{3x + 4y = 10}$ and $\boldsymbol{4x - 3y = 14}$ are perpendicular .

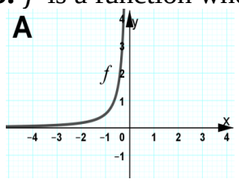
C. The domain of the function $\boldsymbol{f(x) = \frac{-2x}{3x-2}}$ is $\boldsymbol{R - \left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x) = |x+4|}$ is symmetric with respect to the y −axis .

12. The result of $\lim_{x\to 3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

13. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

A



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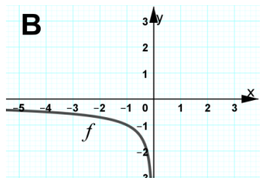

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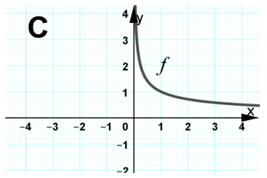
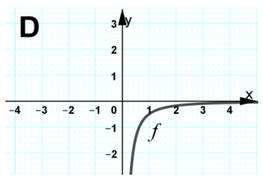


D



14. The result of $\lim_{x\to 4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

15. The points of intersection of the functions $f(x) = x^2 + 2x$ *and* $g(x) = x + 2$. is

A. $\begin{cases}(1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\(-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\ ,-1)\\(2\ ,\ 4)\end{cases}$

16. Find the value of $(\boldsymbol{a})$ so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \geq 0 \end{cases}$

will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D** . $\frac{1}{8}$

17. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2\ , 5\ ]$ **B.** $]-\infty, -2\ ] \cup [5\ , +\infty[$ **C.** $[-5\ , 2\ ]$ **D.** $]-\infty, -5\ ] \cup [2\ , +\infty[$

18. Determine the table of the function $f(x) = \mathrm{C}\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

19. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim_{x\to 1^-} \frac{3}{1-x} = +\infty$

20. Which of the following function is odd ?

A. $f(x) = 2x\ sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

21. Find the result of $\lim_{x\to 1} \frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** **1** **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

22. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to +\infty$

A. $f(x) = x^3 - 2x^2 + 1$ **B.** $f(x) = x^2 - 2x^3 + 1$

C. $f(x) = x^4 - 2x^3 + 1$ **D.** $f(x) = x^3 - 2x^4 + 1$

23. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim_{\Delta x\to 0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

24. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

25. Find the second derivative of the function $f(x) = x\ sinx + cosx$.

A. $f''(x) = -x\ sinx + cosx$ **B.** $f''(x) = x\ cosx + 2sinx$

C. $f''(x) = -x\ cosx + sinx$ **D.** $f''(x) = x\ sinx - 2cosx$

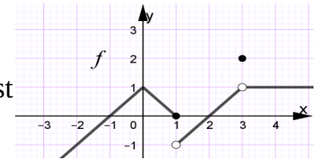
26. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

A. $(0\ , 0)$ **B.** $(1\ , 2)$ **C.** $(0\ , 2)$ **D.** $(-1\ , 2)$

27. The result of $\lim_{x\to 2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

28. Use the given graph on the right to find the result of $\lim_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist

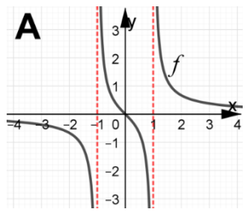


29. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

30. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x)=\frac{x}{x^2-1}$.

A



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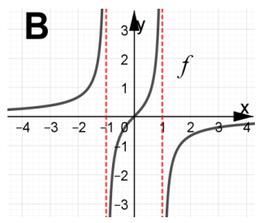
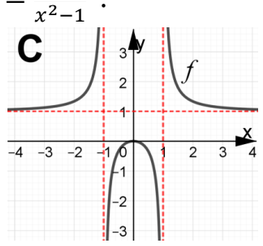
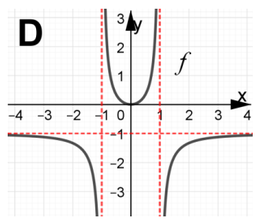


C



D



31. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 12 & x=6\end{cases}$

C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ -2 & x=6\end{cases}$

32. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.** $\boldsymbol{x=-2}$ **C.** $x=6$ **D .** $x=-6$

33. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between $-\mathbf{2}$ and $\mathbf{0}$.

A. $f(x)=\frac{x-1}{x+1}$ **B.** $f(x)=x^2-3x+2$

C. $f(x)=2x^2+3x-3$ **D.** $f(x)=2x^3-2x+1$

34. In which interval is the function $f(x)=e^{\,x^3-6x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.** $]-\infty\,,0\,[\cup]4\,,+\infty[$

35. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

36. Find the critical value of the function $\boldsymbol{f(x)=x^3+6x-5}$

A. $x=-1$ **B.** $x=1$ **C.** $x=2$ **D.** $None$

37. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x)=x^2-1$, $g(x)=2x-1$ **B.** $f(x)=1-x^2$, $g(x)=2x+1$

C. $f(x)=1-x$, $g(x)=2x^2+1$ **D.** $f(x)=2x+1$, $g(x)=x^2-1$

38. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

39. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A. x^2-3x+4 **B.** x^2+x-8 **C.** x^2+x **D.** $2x-3$

40. The function $f(x)=\begin{cases}x & x<1\\ 2 & x=1\\ 2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim_{x\to 1} f(x)$ does not exist .

C. $\lim_{x\to 1} f(x)\neq f(1)$ **D.** $\lim_{x\to 1} f(x)=f(1)$

41. If $3-(\frac{1}{4}x-1)^3\leq f(x)\leq 3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim_{x\to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

42. The range of which of the following functions is $]-\infty,-2\,]$?

A. $f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.** $f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

43. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

44. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

45. The result of $\lim_{x\to-\infty}\frac{3x}{4\cos x-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

46. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

47. Which of the following is true ?

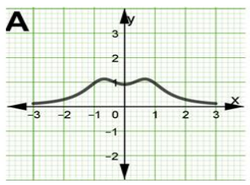
A. $\lim_{x\to 1^+}\frac{-3}{(x-1)^2}=+\infty$ **B.** $\lim_{x\to 0}\frac{\frac{1}{3+x}-\frac{1}{3}}{x}=\frac{1}{9}$ **C.** $\lim_{x\to 0}\frac{\sin 3x}{\sin 2x}=\frac{2}{3}$ **D .** $\lim_{x\to 0}\frac{1-\cos x}{\sin x}=0$

48. Find the value of ($\boldsymbol{b}$) so that the points $(3\,,-4\,)$, $(2\,,\boldsymbol{b}\,)$ and $(1\,,2\,)$ are collinear .

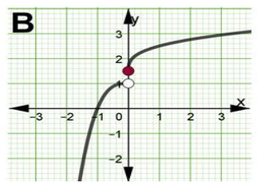
A. -1 **B.** 1 **C.** -2 **D.** 4

49. Which of the following graphs represents a one - to - one function?

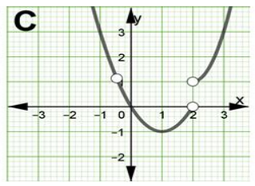
A



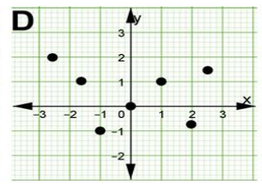
B



C



D



50. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

Kurdistan Region – Iraq 0009 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours I

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000009 71027

Answer the following questions : (two marks for each right choice)

1. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

2. Find the result of $\lim\limits_{x\to 0}\frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

3. Which of the following is false ?

A. The distance between the point $(\,\mathbf{3}\,,\mathbf{-7}\,)$ and the line $\boldsymbol{y=5}$ is $\mathbf{12}$.

B. The lines $\boldsymbol{3x+4y=10}$ and $\boldsymbol{4x-3y=14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x)=\frac{-2x}{3x-2}}$ is $\boldsymbol{R-\left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x)=|x+4|}$ is symmetric with respect to the y −axis .

4. The points of intersection of the functions $f(x)=x^2+2x$ *and* $g(x)=x+2$. is

A. $\begin{cases}(1\ ,\ 3\,)\\(2\ ,\ 0\,)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3\,)\\(2\ ,\ 0\,)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3\,)\\(-2\ ,\ 0\,)\end{cases}$ **D.** $\begin{cases}(-1\,,-1\,)\\(2\ ,\ 4\,)\end{cases}$

5. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x})=3$ **B.** $\frac{d}{dx}(\,\pi^2-3)=2\pi$ **C.** $\lim\limits_{x\to-\infty}\frac{\sqrt{x^2+x}}{-2\,x}=\frac{1}{2}$ **D.** $\lim\limits_{x\to1^-}\frac{3}{1-x}=+\infty$

6. The result of $\lim\limits_{x\to-\infty}\frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

7. Find the derivative of the function $f(x)=\ln x^2$.

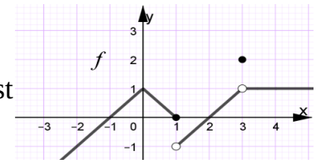
A. $f'(x)=\frac{1}{2\,x}$ **B.** $f'(x)=\frac{2}{x}$ **C.** $f'(x)=\frac{1}{x}$ **D.** $f'(x)=2\ln x$

8. If $f(x)=a\,x^3+x$ find the value of $\boldsymbol{a}$ where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

9. Use the given graph on the right to find the result of $\lim\limits_{x\to3}f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



10. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

11. Determine the table of the function $f(x)=C\sqrt{|\,x\,|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

12. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x)=x^2-1$, $g(x)=2x-1$ **B.** $f(x)=1-x^2$, $g(x)=2x+1$

C. $f(x)=1-x$, $g(x)=2x^2+1$ **D.** $f(x)=2x+1$, $g(x)=x^2-1$

13. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

14. Find the value of $(\boldsymbol{a})$ so that the function $f(x)=\begin{cases}x^3+\frac{1}{2} & x<0\\ 4(x^2+a) & x\geq0\end{cases}$

will be continuous at $x=0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D.** $\frac{1}{8}$

15. Find the rate of change of the distance between a particle moving on the parabola $y=x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt}=2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

16. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between $\mathbf{-2}$ and $\mathbf{0}$.

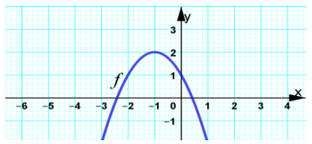
A. $f(x)=\frac{x-1}{x+1}$ **B.** $f(x)=x^2-3x+2$

C. $f(x)=2x^2+3x-3$ **D.** $f(x)=2x^3-2x+1$

17. Which one is the function of the given graph?

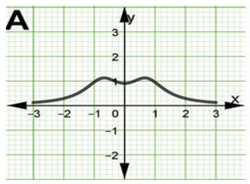
A. $f(x)=-(x+1)^2-2$ **B.** $f(x)=-(x+1)^2+2$

C. $f(x)=-(x-1)^2+2$ **D.** $f(x)=-(x-1)^2-2$

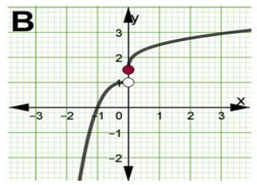


18. Which of the following graphs represents a one - to - one function?

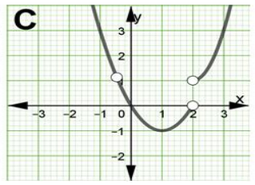
A



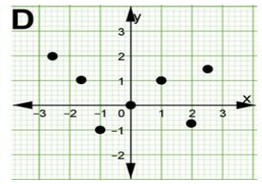
B



C



D



19. Find the value of ($\boldsymbol{b}$) so that the points $(3\,,-4\,)$, $(2\,,\boldsymbol{b}\,)$ and $(1\,,2\,)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

20. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 12 & x=6\end{cases}$

C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ -2 & x=6\end{cases}$

21. The result of $\lim\limits_{x\to2}\frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

22. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

23. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

24. Find the derivative of the function $f(x)=\frac{x}{\sqrt{x^4+1}}$.

A. $f'(x)=\frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x)=\frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x)=\frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x)=\frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

25. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

26. Find the result of $\lim\limits_{x\to1}\frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

27. Which of the following is true ?

A. $\lim\limits_{x\to1^+}\frac{-3}{(x-1)^2}=+\infty$ **B.** $\lim\limits_{x\to0}\frac{\frac{1}{3+x}-\frac{1}{3}}{x}=\frac{1}{9}$ **C.** $\lim\limits_{x\to0}\frac{\sin 3x}{\sin 2x}=\frac{2}{3}$ **D** .$\lim\limits_{x\to0}\frac{1-cosx}{sinx}=0$

28. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x+y=-5$.

A.$y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

29. Which of the following function is odd ?

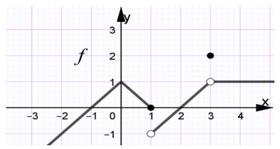
A. $f(x)=2x\ sinx$ **B.** $f(x)=\frac{3}{x^2}$ **C.** $f(x)=\frac{x}{|x|}$ **D.** $f(x)=x+cosx$

30. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

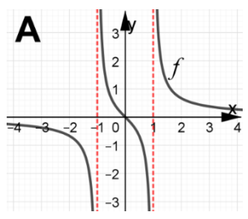
A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

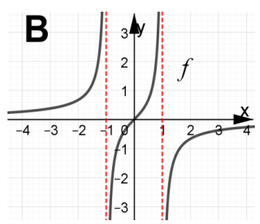
31. Use the given graph on the right to find the result of $\lim\limits_{x\to1^-}f(x)$

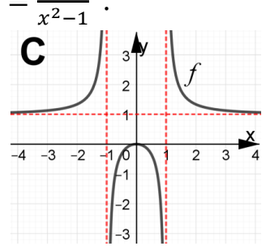
A. 0 **B.** -1 **C.** 1 **D.** Does not exist .

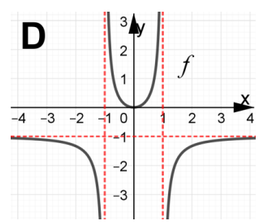


32. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x)=\frac{x}{x^2-1}$.









33. The result of $\lim\limits_{x\to3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

34. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to-\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to+\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$

C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

35. If $3-(\frac{1}{4}x-1)^3\le f(x)\le3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to4}f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

36. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , t is measured in seconds and S in meters . Find the average velocity of this point during the first three seconds . (**A.**-5 **B.** 5 **C.**-3 **D.** 3) (m/sec)

37. The function $f(x)=\begin{cases}x & x<1\\ 2 & x=1\\ 2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to1}f(x)$ does not exist .

C. $\lim\limits_{x\to1}f(x)\neq f(1)$ **D.** $\lim\limits_{x\to1}f(x)=f(1)$

38. Find the critical value of the function $\boldsymbol{f(x)=x^3+6x-5}$

A.$x=-1$ **B.**$x=1$ **C.**$x=2$ **D.**$None$

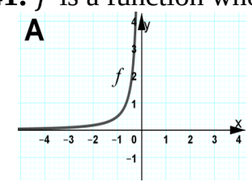
39. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

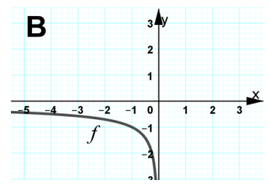
A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

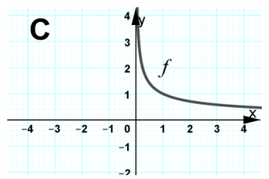
40. The y –intercept of the line $y=-3x-4$ is :

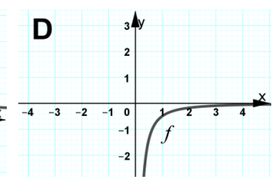
A. $(0\,,4\,)$ **B.** $(0\,,-4\,)$ **C.** $(0\,,3\,)$ **D.** $(0\,,-3\,)$

41. f is a function whose derivative is an increasing function, find a graph of f where $f'<0$









42. Find the horizontal asymptote to the graph of a function $f(x)=\frac{5x^3-2x^2}{1-2x^3}$.

A. $y=\frac{5}{2}$ **B.** $y=-\frac{5}{2}$ **C.** $y=\frac{3}{2}$ **D.** $y=-\frac{3}{2}$

43. If $f(x)=\frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to0}\frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.**$\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

44. Find the second derivative of the function $f(x)=x\ sinx+cosx$.

A. $f''(x)=-x\ sinx+cosx$ **B.** $f''(x)=x\ cosx+2sinx$

C. $f''(x)=-x\ cosx+sinx$ **D.** $f''(x)=x\ sinx-2cosx$

45. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

46. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.**$\boldsymbol{x}=-2$ **C.** $x=6$ **D .** $x=-6$

47. The range of which of the following functions is $]-\infty,-2\,]$?

A.$f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.**$f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

48. The result of $\lim\limits_{x\to4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

49. In which interval is the function $f(x)=e^{\,x^3-6x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.**$]-\infty\,,0\,[\cup]4\,,+\infty[$

50. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A.x^2-3x+4 **B.**x^2+x-8 **C.**x^2+x **D.** $2x-3$

Kurdistan Region – Iraq 0010 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours J

71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000010

Answer the following questions : (two marks for each right choice)

1. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , t is measured in seconds and S in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

2. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x) = x^3 - 2x^2 + 1$ **B.** $f(x) = x^2 - 2x^3 + 1$

C. $f(x) = x^4 - 2x^3 + 1$ **D.** $f(x) = x^3 - 2x^4 + 1$

3. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

4. Find the critical value of the function $\boldsymbol{f(x) = x^3 + 6x - 5}$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

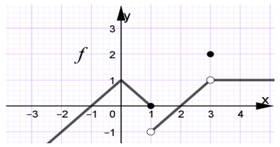
5. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

A. $(0\ ,0)$ **B.** $(1\ ,2)$ **C.** $(0\ ,2)$ **D.** $(-1\ ,2)$

6. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x \to 0} \frac{f(2+\Delta x) - f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

7. Use the given graph on the right to find the result of $\lim\limits_{x \to 1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



8. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

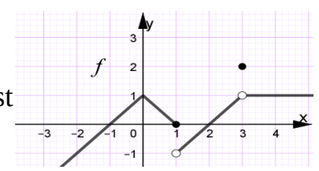
A. $y = \frac{-3}{4}x + 8$ **B.** $y = \frac{3}{4}x + 2$ **C.** $y = \frac{3}{4}x - 7$ **D.** $y = \frac{1}{4}x + 4$

9. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3 - 2x^2}{1 - 2x^3}$.

A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

10. Use the given graph on the right to find the result of $\lim\limits_{x \to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



11. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between -2 and 0 .

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

12. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x + y = -5$.

A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

13. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

14. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

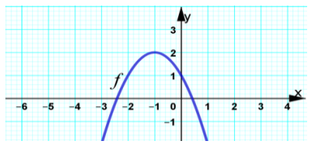
15. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ln x$

16. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



17. The result of $\lim\limits_{x \to 2} \frac{\sqrt{6-x} - 2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

18. Find the value of (b) so that the points $(3\ ,-4)$, $(2\ ,b)$ and $(1\ ,2)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

19. The points of intersection of the functions $f(x) = x^2 + 2x\ and\ g(x) = x + 2$. is

A. $\begin{cases}(1\ ,\ 3) \\ (2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3) \\ (2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3) \\ (-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\ ,-1) \\ (2\ ,\ 4)\end{cases}$

20. The range of which of the following functions is $]-\infty, -2\,]$?

A. $f(x) = -\sqrt{x} - 2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x} - 2$

21. The result of $\lim\limits_{x \to 4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

22. Which of the following is true ?

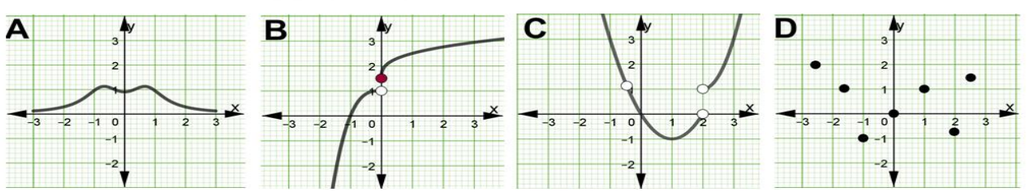
A. $\lim\limits_{x \to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim\limits_{x \to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim\limits_{x \to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D** . $\lim\limits_{x \to 0} \frac{1-cosx}{sinx} = 0$

23. The function $f(x) = \begin{cases} x & x < 1 \\ 2 & x = 1 \\ 2x - 1 & x > 1 \end{cases}$ is discontinuous at $x = 1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x \to 1} f(x)$ does not exist .

C. $\lim\limits_{x \to 1} f(x) \neq f(1)$ **D.** $\lim\limits_{x \to 1} f(x) = f(1)$

24. Which of the following graphs represents a one - to - one function?



25. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

26. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

27. Find the second derivative of the function $f(x) = x\,sinx + cosx$.

A. $f''(x) = -x\,sinx + cosx$ **B.** $f''(x) = x\,cosx + 2sinx$

C. $f''(x) = -x\,cosx + sinx$ **D.** $f''(x) = x\,sinx - 2cosx$

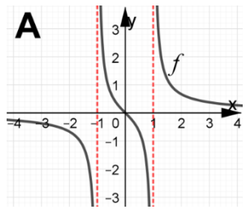
28. Find the result of $\lim\limits_{x\to 1} \frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

29. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :

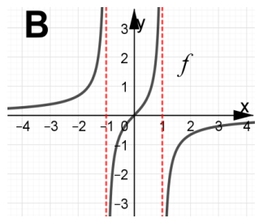
A. $y = 3x + 8$ **B.** $y = 3x - 8$ **C.** $y = x + 3$ **D.** $y = x - 3$

30. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.

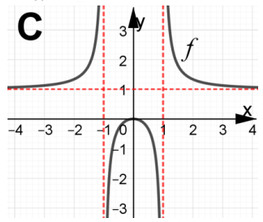
A



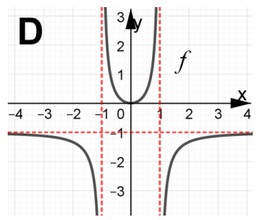
B



C



D



31. Find the value of (a) so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \geq 0 \end{cases}$

will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D.** $\frac{1}{8}$

32. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim\limits_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim\limits_{x\to 1^-} \frac{3}{1-x} = +\infty$

33. If $f(x) = a\,x^3 + x$ find the value of a where $f'(2) = 13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

34. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

35. Find the result of $\lim\limits_{x\to 0} \frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

36. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,] \cup [5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,] \cup [2\,,+\infty[$

37. Which of the following is false ?

A. The distance between the point $(\,\mathbf{3}\,,\mathbf{-7}\,)$ and the line $\boldsymbol{y = 5}$ is $\mathbf{12}$.

B. The lines $\mathbf{3x + 4y = 10}$ and $\mathbf{4x - 3y = 14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x) = \frac{-2x}{3x-2}}$ is $\boldsymbol{R - \left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x) = |x + 4|}$ is symmetric with respect to the y −axis .

38. If $3 - (\frac{1}{4}x - 1)^3 \leq f(x) \leq 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

39. The result of $\lim\limits_{x\to 3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

40. Which of the following function is odd ?

A. $f(x) = 2x\,sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

41. The y –intercept of the line $y = -3x - 4$ is :

A. $(0\,,4\,)$ **B.** $(0\,,-4\,)$ **C.** $(0\,,3\,)$ **D.** $(0\,,-3\,)$

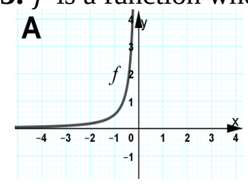
42. Redefine the function $f(x) = \frac{x^2-4x-12}{x-6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 4 & x = 6 \end{cases}$ **B.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 12 & x = 6 \end{cases}$

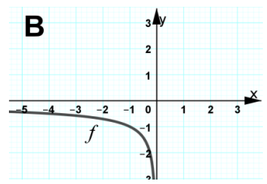
C. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 8 & x = 6 \end{cases}$ **D.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ -2 & x = 6 \end{cases}$

43. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

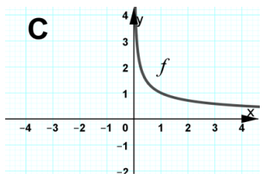
A



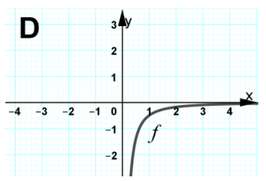
B



C



D



44. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

45. The result of $\lim\limits_{x\to-\infty} \frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

46. In which interval is the function $f(x) = e^{\,x^3-6x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.** $]-\infty\,,0\,[\,\cup\,]4\,,+\infty[$

47. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

48. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

49. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

50. At which value of x the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $x = -2$ **C.** $x = 6$ **D .** $x = -6$

Kurdistan Region – Iraq 0011 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours K 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000011

Answer the following questions : (two marks for each right choice)

1. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

2. The result of $\lim\limits_{x\to 2}\frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

3. Find the result of $\lim\limits_{x\to 1}\frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

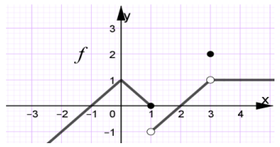
4. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , t is measured in seconds and S in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

5. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

6. Use the given graph on the right to find the result of $\lim\limits_{x\to 1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



7. If $3-(\frac{1}{4}x-1)^3\le f(x)\le 3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

8. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between -2 and 0 .

A. $f(x)=\frac{x-1}{x+1}$ **B.** $f(x)=x^2-3x+2$

C. $f(x)=2x^2+3x-3$ **D.** $f(x)=2x^3-2x+1$

9. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 12 & x=6\end{cases}$

C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ -2 & x=6\end{cases}$

10. Find the value of (a) so that the function $f(x)=\begin{cases}x^3+\frac{1}{2} & x<0\\ 4(x^2+a) & x\ge 0\end{cases}$ will be continuous at $x=0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D.** $\frac{1}{8}$

11. Find the value of (b) so that the points $(3\,,-4)$, $(2\,,b)$ and $(1\,,2)$ are collinear .

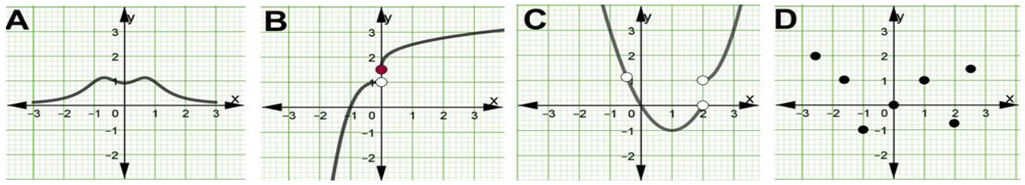
A. -1 **B.** 1 **C.** -2 **D.** 4

12. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

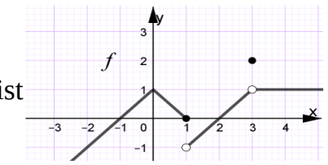
13. Find the result of $\lim\limits_{x\to 0}\frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

14. Which of the following graphs represents a one - to - one function?



15. Use the given graph on the right to find the result of $\lim\limits_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



16. Find the derivative of the function $f(x)=\frac{x}{\sqrt{x^4+1}}$.

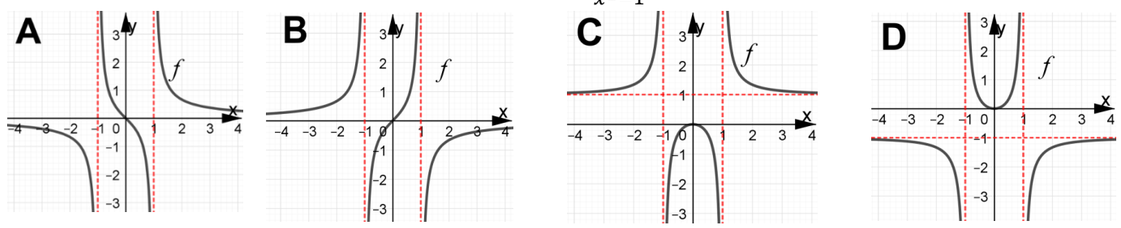
A. $f'(x)=\frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x)=\frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x)=\frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x)=\frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

17. The points of intersection of the functions $f(x)=x^2+2x$ *and* $g(x)=x+2$. is

A. $\begin{cases}(1\ ,\ 3)\\ (2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\ (2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\ (-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\,,-1)\\ (2\ ,\ 4)\end{cases}$

18. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x)=\frac{x}{x^2-1}$.



19. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

20. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

21. Determine the table of the function $f(x)=C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

22. If $f(x)=\frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to 0}\frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

23. Which of the following is true ?

A. $\lim\limits_{x\to1^+}\frac{-3}{(x-1)^2}=+\infty$ **B.** $\lim\limits_{x\to0}\frac{\frac{1}{3+x}-\frac{1}{3}}{x}=\frac{1}{9}$ **C.** $\lim\limits_{x\to0}\frac{\sin 3x}{\sin 2x}=\frac{2}{3}$ **D .** $\lim\limits_{x\to0}\frac{1-cosx}{sinx}=0$

24. At which value of x the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.** $x=-2$ **C.** $x=6$ **D .** $x=-6$

25. Find the critical value of the function $f(x)=x^3+6x-5$

A. $x=-1$ **B.** $x=1$ **C.** $x=2$ **D.** $None$

26. Which of the following function is odd ?

A. $f(x)=2x\,sinx$ **B.** $f(x)=\frac{3}{x^2}$ **C.** $f(x)=\frac{x}{|x|}$ **D.** $f(x)=x+cosx$

27. The function $f(x)=\begin{cases}x & x<1\\ 2 & x=1\\ 2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to1}f(x)$ does not exist .

C. $\lim\limits_{x\to1}f(x)\neq f(1)$ **D.** $\lim\limits_{x\to1}f(x)=f(1)$

28. The result of $\lim\limits_{x\to3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

29. Find the derivative of the function $f(x)=\ln x^2$.

A. $f'(x)=\frac{1}{2x}$ **B.** $f'(x)=\frac{2}{x}$ **C.** $f'(x)=\frac{1}{x}$ **D.** $f'(x)=2\ln x$

30. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

31. Find the horizontal asymptote to the graph of a function $f(x)=\frac{5x^3-2x^2}{1-2x^3}$.

A. $y=\frac{5}{2}$ **B.** $y=-\frac{5}{2}$ **C.** $y=\frac{3}{2}$ **D.** $y=-\frac{3}{2}$

32. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to-\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to+\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$

C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

33. Find the equation of the line that passes through the point $(-2\,,5)$ and that is parallel to the line $3x+y=-5$.

A. $y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

34. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

35. If $f(x)=a\,x^3+x$ find the value of a where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

36. The y –intercept of the line $y=-3x-4$ is :

A. $(0\,,4)$ **B.** $(0\,,-4)$ **C.** $(0\,,3)$ **D.** $(0\,,-3)$

37. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x})=3$ **B.** $\frac{d}{dx}(\pi^2-3)=2\pi$ **C.** $\lim\limits_{x\to-\infty}\frac{\sqrt{x^2+x}}{-2x}=\frac{1}{2}$ **D.** $\lim\limits_{x\to1^-}\frac{3}{1-x}=+\infty$

38. Find the rate of change of the distance between a particle moving on the parabola $y=x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt}=2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

39. The result of $\lim\limits_{x\to-\infty}\frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

40. Which of the following is false ?

A. The distance between the point $(3\,,-7)$ and the line $y=5$ is 12 .

B. The lines $3x+4y=10$ and $4x-3y=14$ are perpendicular .

C. The domain of the function $f(x)=\frac{-2x}{3x-2}$ is $R-\left\{\frac{2}{3}\right\}$.

D. The graph of the function $f(x)=|x+4|$ is symmetric with respect to the y –axis .

41. Find the second derivative of the function $f(x)=x\,sinx+cosx$.

A. $f''(x)=-x\,sinx+cosx$ **B.** $f''(x)=x\,cosx+2sinx$

C. $f''(x)=-x\,cosx+sinx$ **D.** $f''(x)=x\,sinx-2cosx$

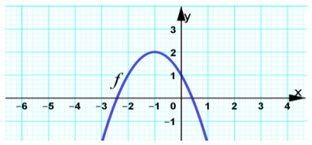
42. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A. x^2-3x+4 **B.** x^2+x-8 **C.** x^2+x **D.** $2x-3$

43. Which one is the function of the given graph?

A. $f(x)=-(x+1)^2-2$ **B.** $f(x)=-(x+1)^2+2$

C. $f(x)=-(x-1)^2+2$ **D.** $f(x)=-(x-1)^2-2$



44. In which interval is the function $f(x)=e^{\,x^3-6x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.** $]-\infty\,,0\,[\cup]4\,,+\infty[$

45. The result of $\lim\limits_{x\to4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

46. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x)=x^2-1$, $g(x)=2x-1$ **B.** $f(x)=1-x^2$, $g(x)=2x+1$

C. $f(x)=1-x$, $g(x)=2x^2+1$ **D.** $f(x)=2x+1$, $g(x)=x^2-1$

47. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 m^2 B. 850 m^2 C. 784 m^2 D. 824 m^2

48. The range of which of the following functions is $]-\infty,-2\,]$?

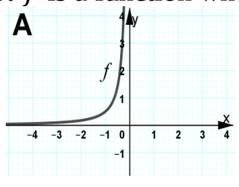
A. $f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.** $f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

49. Find the domain of the function $f(x)=-\sqrt{x^2-3x-10}$.

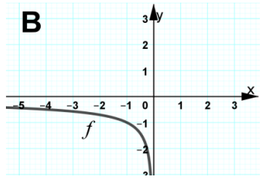
A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

50. f is a function whose derivative is an increasing function, find a graph of f where $f'<0$

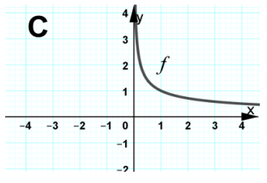
A



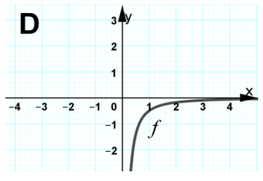
B



C



D



Kurdistan Region – Iraq 0012 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours L 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

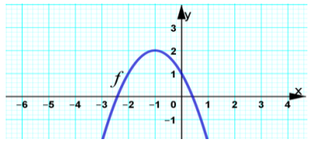
SN: 400000012

Answer the following questions : (two marks for each right choice)

1. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



2. Find the second derivative of the function $f(x) = x\,sinx + cosx$.

A. $f''(x) = -x\,sinx + cosx$ **B.** $f''(x) = x\,cosx + 2sinx$

C. $f''(x) = -x\,cosx + sinx$ **D.** $f''(x) = x\,sinx - 2cosx$

3. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $x = -2$ **C.** $x = 6$ **D .** $x = -6$

4. The result of $\lim\limits_{x\to 3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

5. The points of intersection of the functions $f(x) = x^2 + 2x$ *and* $g(x) = x + 2$. is

A. $\begin{cases}(1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\(-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\ ,-1)\\(2\ ,\ 4)\end{cases}$

6. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2\ ,5\ ]$ **B.** $]-\infty,-2\ ] \cup [5\ ,+\infty[$ **C.** $[-5\ ,2\ ]$ **D.** $]-\infty,-5\ ] \cup [2\ ,+\infty[$

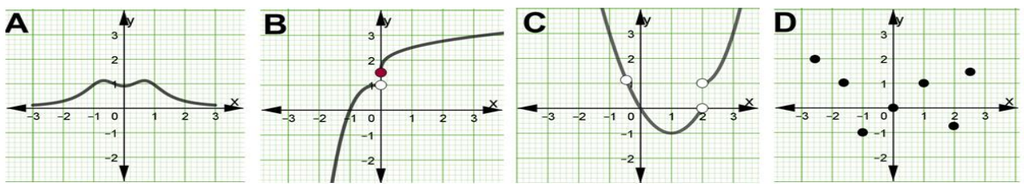
7. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

A. $y = \frac{-3}{4}x + 8$ **B.** $y = \frac{3}{4}x + 2$ **C.** $y = \frac{3}{4}x - 7$ **D.** $y = \frac{1}{4}x + 4$

8. Find the value of ($\boldsymbol{b}$) so that the points $(3\ ,-4\ )$, $(2\ ,\boldsymbol{b}\ )$ and $(1\ ,2\ )$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

9. Which of the following graphs represents a one - to - one function?



10. The y –intercept of the line $y = -3x - 4$ is :

A. $(0\ ,4\ )$ **B.** $(0\ ,-4\ )$ **C.** $(0\ ,3\ )$ **D.** $(0\ ,-3\ )$

11. If $f(x) = a\,x^3 + x$ find the value of $\boldsymbol{a}$ where $f'(2) = 13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

12. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ln x$

13. The result of $\lim\limits_{x\to-\infty} \frac{3x}{4\,cosx - 2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

14. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

15. Which of the following is false ?

A. The distance between the point $(\ \boldsymbol{3}\ ,\boldsymbol{-7}\ )$ and the line $\boldsymbol{y = 5}$ is $\boldsymbol{12}$.

B. The lines $\boldsymbol{3x + 4y = 10}$ and $\boldsymbol{4x - 3y = 14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x) = \frac{-2x}{3x-2}}$ is $\boldsymbol{R - \left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x) = |x+4|}$ is symmetric with respect to the y –axis .

16. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

17. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim\limits_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim\limits_{x\to1^-} \frac{3}{1-x} = +\infty$

18. Redefine the function $f(x) = \frac{x^2-4x-12}{x-6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases}\frac{x^2-4x-12}{x-6} & x \neq 6\\ 4 & x = 6\end{cases}$ **B.** $h(x) = \begin{cases}\frac{x^2-4x-12}{x-6} & x \neq 6\\ 12 & x = 6\end{cases}$

C. $h(x) = \begin{cases}\frac{x^2-4x-12}{x-6} & x \neq 6\\ 8 & x = 6\end{cases}$ **D.** $h(x) = \begin{cases}\frac{x^2-4x-12}{x-6} & x \neq 6\\ -2 & x = 6\end{cases}$

19. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x + y = -5$.

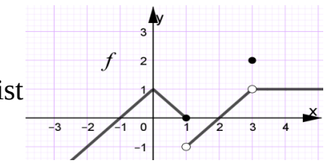
A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

20. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

A. $(0\ ,0)$ **B.** $(1\ ,2)$ **C.** $(0\ ,2)$ **D.** $(-1\ ,2)$

21. Use the given graph on the right to find the result of $\lim\limits_{x\to3} f(x)$

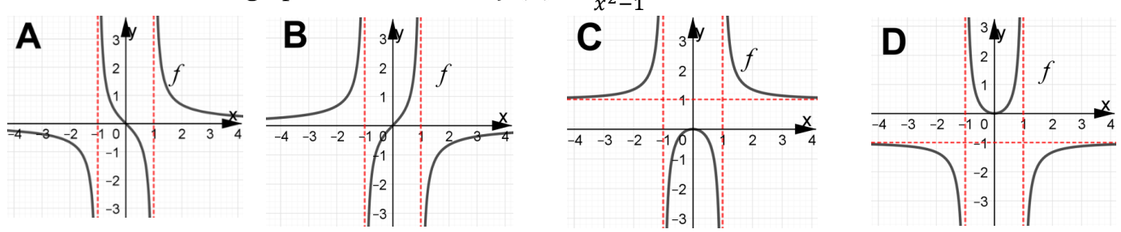
A. 1 **B.** 0 **C.** 2 **D.** Does not exist



22. Which of the following is true ?

A. $\lim\limits_{x\to1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim\limits_{x\to0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim\limits_{x\to0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D .** $\lim\limits_{x\to0} \frac{1-cosx}{sinx} = 0$

23. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.



24. Find the result of $\lim\limits_{x\to0} \frac{e^x - 1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

25. Find the derivative of the function $f(x)=\frac{x}{\sqrt{x^4+1}}$.

A. $f'(x)=\frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x)=\frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x)=\frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x)=\frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

26. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$ ، $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$

C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

27. Find the horizontal asymptote to the graph of a function $f(x)=\frac{5x^3-2x^2}{1-2x^3}$.

A. y = $\frac{5}{2}$ **B.** y = $-\frac{5}{2}$ **C.** y = $\frac{3}{2}$ **D.** y = $-\frac{3}{2}$

28. Find the rate of change of the distance between a particle moving on the parabola $y=x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt}=2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

29. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , t is measured in seconds and S in meters . Find the average velocity of this point during the first three seconds . (**A.**-5 **B.** 5 **C.**-3 **D.** 3) (m/sec)

30. The function $f(x)=\begin{cases}x & x<1\\ 2 & x=1\\ 2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim_{x\to1} f(x)$ does not exist .

C. $\lim_{x\to1} f(x)\neq f(1)$ **D.** $\lim_{x\to1} f(x)=f(1)$

31. Determine the table of the function $f(x)=C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

32. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x)=x^2-1$, $g(x)=2x-1$ **B.** $f(x)=1-x^2$, $g(x)=2x+1$

C. $f(x)=1-x$, $g(x)=2x^2+1$ **D.** $f(x)=2x+1$, $g(x)=x^2-1$

33. Find the result of $\lim_{x\to1}\frac{\sqrt{x}-1}{1-x}$: **A.**-1 **B.** **1** **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

34. The range of which of the following functions is $]-\infty,-2\,]$?

A. $f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.** $f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

35. The result of $\lim_{x\to2}\frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.**-4 **C.** $\frac{1}{4}$ **D.** 4

36. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

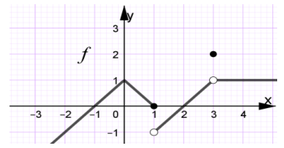
37. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between -2 and **0** .

A. $f(x)=\frac{x-1}{x+1}$ **B.** $f(x)=x^2-3x+2$

C. $f(x)=2x^2+3x-3$ **D.** $f(x)=2x^3-2x+1$

38. Use the given graph on the right to find the result of $\lim_{x\to1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



39. Which of the following function is odd ?

A. $f(x)=2x\ sinx$ **B.** $f(x)=\frac{3}{x^2}$ **C.** $f(x)=\frac{x}{|x|}$ **D.** $f(x)=x+cosx$

40. If $f(x)=\frac{-4}{5-x}$ then the result of $\lim_{\Delta x\to0}\frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.**$\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

41. If $3-(\frac{1}{4}x-1)^3\leq f(x)\leq 3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim_{x\to4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

42. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.**$-\sqrt{3}$ **C.** 1 **D.** -1

43. In which interval is the function $f(x)=e^{x^3-6x^2+8}$ increasing ?

A. $]-\infty,4\,[$ **B.** $]2,4[$ **C.** $]0,4[$ **D.**$]-\infty,0\,[\cup]4,+\infty[$

44. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

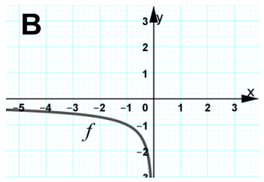
45. Find the value of (a) so that the function $f(x)=\begin{cases}x^3+\frac{1}{2} & x<0\\ 4(x^2+a) & x\geq0\end{cases}$

will be continuous at $x=0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

46. f is a function whose derivative is an increasing function, find a graph of f where $f'<0$

A

B



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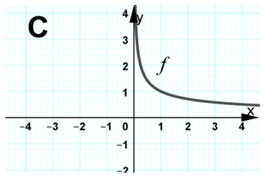

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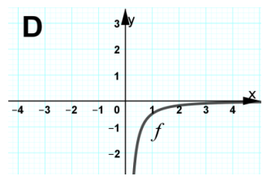


47. The result of $\lim_{x\to4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

48. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

49. Find the critical value of the function $f(x)=x^3+6x-5$

A. $x=-1$ **B.** $x=1$ **C.** $x=2$ **D.** $None$

50. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 m^2 B. 850 m^2 C. 784 m^2 D. 824 m^2

Kurdistan Region – Iraq 0013 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours **M** 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000013

Answer the following questions : (two marks for each right choice)

1. In which interval is the function $f(x) = e^{x^3-6x^2+8}$ increasing ?

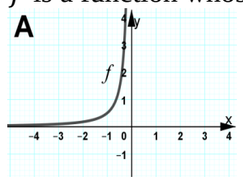
A. $]-\infty, 4[$ **B.** $]2, 4[$ **C.** $]0, 4[$ **D.** $]-\infty, 0[\cup]4, +\infty[$

2. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

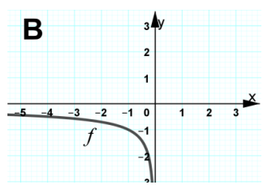
A. $(0, 0)$ **B.** $(1, 2)$ **C.** $(0, 2)$ **D.** $(-1, 2)$

3. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

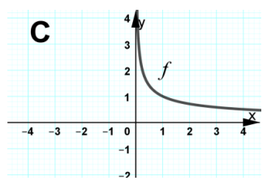
A



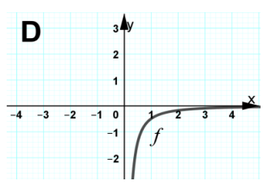
B



C

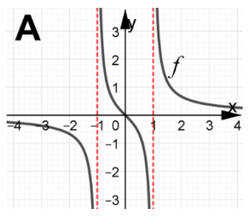


D

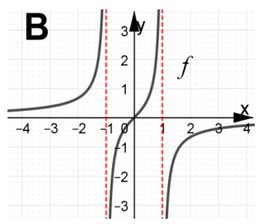


4. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.

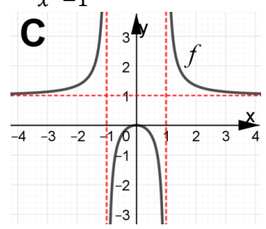
A



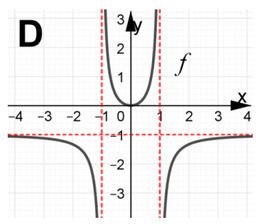
B



C



D



5. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim_{\Delta x \to 0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

6. The points of intersection of the functions $f(x) = x^2 + 2x \text{ and } g(x) = x + 2.$ is

A. $\begin{cases}(1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\(-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\ ,-1)\\(2\ ,\ 4)\end{cases}$

7. Find the result of $\lim_{x \to 0} \frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

8. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

9. Which of the following function is odd ?

A. $f(x) = 2x\ sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

10. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

11. Find the critical value of the function $\boldsymbol{f(x) = x^3 + 6x - 5}$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

12. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x) = x^3 - 2x^2 + 1$ **B.** $f(x) = x^2 - 2x^3 + 1$

C. $f(x) = x^4 - 2x^3 + 1$ **D.** $f(x) = x^3 - 2x^4 + 1$

13. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

14. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

15. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ \ln x$

16. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

17. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between -2 and 0 .

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

18. If $3 - (\frac{1}{4}x - 1)^3 \le f(x) \le 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim_{x \to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

19. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3-2x^2}{1-2x^3}$.

A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

20. Which of the following is true ?

A. $\lim_{x \to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim_{x \to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim_{x \to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D** . $\lim_{x \to 0} \frac{1-cosx}{sinx} = 0$

21. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :

A. $y = 3x + 8$ **B.** $y = 3x - 8$ **C.** $y = x + 3$ **D.** $y = x - 3$

22. Find the value of $(\boldsymbol{a})$ so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \ge 0 \end{cases}$

will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D** . $\frac{1}{8}$

23. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

24. The result of $\lim_{x \to 3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

25. The function $f(x) = \begin{cases} x & x < 1 \\ 2 & x = 1 \\ 2x - 1 & x > 1 \end{cases}$ is discontinuous at $x = 1$ because :

A. $f(1)$ is not defined. **B.** $\lim_{x \to 1} f(x)$ does not exist .

C. $\lim_{x \to 1} f(x) \ne f(1)$ **D.** $\lim_{x \to 1} f(x) = f(1)$

26. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

27. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

28. Which of the following is false ?

A. The distance between the point ($\boldsymbol{3\,,-7}$) and the line $\boldsymbol{y=5}$ is $\boldsymbol{12}$.

B. The lines $\boldsymbol{3x+4y=10}$ and $\boldsymbol{4x-3y=14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x)=\frac{-2x}{3x-2}}$ is $\boldsymbol{R-\left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x)=|x+4|}$ is symmetric with respect to the y −axis .

29. Find the rate of change of the distance between a particle moving on the parabola $y=x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt}=2\ cm/s$.

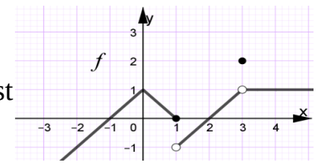
A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

30. Find the result of $\lim\limits_{x\to1}\frac{\sqrt{x}-1}{1-x}$: **A.** $\boldsymbol{-1}$ **B.** $\boldsymbol{1}$ **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

31. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.**-5 **B.** 5 **C.**-3 **D.** 3) (m/sec)

32. Use the given graph on the right to find the result of $\lim\limits_{x\to3}f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



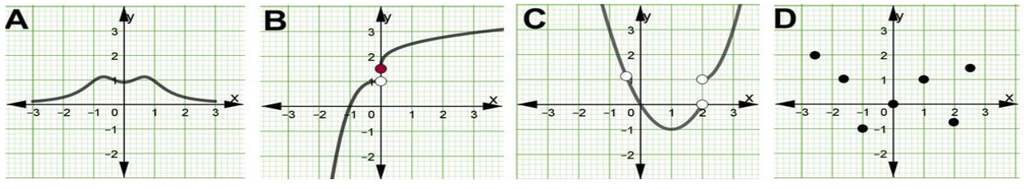
33. The result of $\lim\limits_{x\to-\infty}\frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

34. The result of $\lim\limits_{x\to2}\frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.**-4 **C.** $\frac{1}{4}$ **D.** 4

35. If $f(x)=a\,x^3+x$ find the value of $\boldsymbol{a}$ where $f'(2)=13$.

A. 2 **B.**-2 **C.**-1 **D.** 1

36. Which of the following graphs represents a one - to - one function?



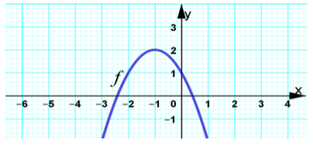
37. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x})=3$ **B.** $\frac{d}{dx}(\pi^2-3)=2\pi$ **C.** $\lim\limits_{x\to-\infty}\frac{\sqrt{x^2+x}}{-2\,x}=\frac{1}{2}$ **D.** $\lim\limits_{x\to1^-}\frac{3}{1-x}=+\infty$

38. Which one is the function of the given graph?

A. $f(x)=-(x+1)^2-2$ **B.** $f(x)=-(x+1)^2+2$

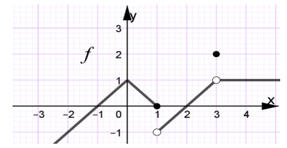
C. $f(x)=-(x-1)^2+2$ **D.** $f(x)=-(x-1)^2-2$



39. The result of $\lim\limits_{x\to4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

40. Use the given graph on the right to find the result of $\lim\limits_{x\to1^-}f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



41. Find the second derivative of the function $f(x)=x\,sinx+cosx$.

A. $f''(x)=-x\,sinx+cosx$ **B.** $f''(x)=x\,cosx+2sinx$

C. $f''(x)=-x\,cosx+sinx$ **D.** $f''(x)=x\,sinx-2cosx$

42. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x+y=-5$.

A.$y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

43. Find the domain of the function $f(x)=-\sqrt{x^2-3x-10}$.

A.$[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

44. The range of which of the following functions is $]-\infty,-2\,]$?

A.$f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.**$f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

45. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

46. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.**$\boldsymbol{x=}\ -2$ **C.** $x=6$ **D .** $x=-6$

47. The y –intercept of the line $y=-3x-4$ is :

A. $(0\,,4\,)$ **B.** $(0\,,-4\,)$ **C.** $(0\,,3\,)$ **D.** $(0\,,-3\,)$

48. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 12 & x=6\end{cases}$

C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ -2 & x=6\end{cases}$

49. Find the value of ($\boldsymbol{b}$) so that the points $(3\,,-4\,)$, $(2\,,\boldsymbol{b}\,)$ and $(1\,,2\,)$ are collinear .

A.-1 **B.** 1 **C.**-2 **D.** 4

50. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.**$-\sqrt{3}$ **C.** 1 **D.** -1

Kurdistan Region – Iraq 0014 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours N 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000014

Answer the following questions : (two marks for each right choice)

1. Find the second derivative of the function $f(x) = x\,sinx + cosx$.

A. $f''(x) = -x\,sinx + cosx$ **B.** $f''(x) = x\,cosx + 2sinx$

C. $f''(x) = -x\,cosx + sinx$ **D.** $f''(x) = x\,sinx - 2cosx$

2. The points of intersection of the functions $f(x) = x^2 + 2x$ *and* $g(x) = x + 2$. is

A. $\begin{cases}(1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\(-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\ ,-1)\\(2\ ,\ 4)\end{cases}$

3. Find the value of $(\boldsymbol{a})$ so that the function $f(x) = \begin{cases}x^3 + \frac{1}{2} & x < 0\\ 4(x^2 + a) & x \geq 0\end{cases}$

will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

4. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x + y = -5$.

A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

5. The result of $\lim\limits_{x\to 3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

6. Which of the following is true ?

A. $\lim\limits_{x\to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim\limits_{x\to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim\limits_{x\to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D .** $\lim\limits_{x\to 0} \frac{1-cosx}{sinx} = 0$

7. Which of the following function is odd ?

A. $f(x) = 2x\,sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

8. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $\boldsymbol{x = -2}$ **C.** $x = 6$ **D .** $x = -6$

9. Find the critical value of the function $\boldsymbol{f(x) = x^3 + 6x - 5}$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** *None*

10. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to 0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

11. The result of $\lim\limits_{x\to 4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

12. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

13. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :

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16. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

A. $(0\ ,0)$ **B.** $(1\ ,2)$ **C.** $(0\ ,2)$ **D.** $(-1\ ,2)$

17. The function $f(x) = \begin{cases}x & x < 1\\ 2 & x = 1\\ 2x - 1 & x > 1\end{cases}$ is discontinuous at $x = 1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to 1} f(x)$ does not exist .

C. $\lim\limits_{x\to 1} f(x) \neq f(1)$ **D.** $\lim\limits_{x\to 1} f(x) = f(1)$

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20. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

21. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3-2x^2}{1-2x^3}$.

A. y = $\frac{5}{2}$ **B.** y = $-\frac{5}{2}$ **C.** y = $\frac{3}{2}$ **D.** y = $-\frac{3}{2}$

22. If $f(x) = a\,x^3 + x$ find the value of $\boldsymbol{a}$ where $f'(2) = 13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

23. The range of which of the following functions is $]-\infty, -2\,]$?

A. $f(x) = -\sqrt{x} - 2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x} - 2$

24. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

25. Which of the following is false ?

A. The distance between the point $(\boldsymbol{3\ ,-7})$ and the line $\boldsymbol{y = 5}$ is **12** .

B. The lines $\boldsymbol{3x + 4y = 10}$ and $\boldsymbol{4x - 3y = 14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x) = \frac{-2x}{3x-2}}$ is $\boldsymbol{R - \left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x) = |x + 4|}$ is symmetric with respect to the y −axis .

26. If $3 - (\frac{1}{4}x - 1)^3 \leq f(x) \leq 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

27. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x) = x^3 - 2x^2 + 1$ **B.** $f(x) = x^2 - 2x^3 + 1$

C. $f(x) = x^4 - 2x^3 + 1$ **D.** $f(x) = x^3 - 2x^4 + 1$

28. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2\ ,5\ ]$ **B.** $]-\infty, -2\ ] \cup [5\ , +\infty[$ **C.** $[-5\ ,2\ ]$ **D.** $]-\infty, -5\ ] \cup [2\ , +\infty[$

29. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

30. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

A. $y = \frac{-3}{4}x + 8$ **B.** $y = \frac{3}{4}x + 2$ **C.** $y = \frac{3}{4}x - 7$ **D.** $y = \frac{1}{4}x + 4$

31. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ln x$

32. Find the result of $\lim_{x\to 1} \frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

33. Find the value of (b) so that the points $(3, -4)$, $(2, b)$ and $(1, 2)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

34. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

35. The result of $\lim_{x\to-\infty} \frac{3x}{4\cos x - 2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

36. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between -2 and 0 .

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

37. Find the result of $\lim_{x\to 0} \frac{e^x - 1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

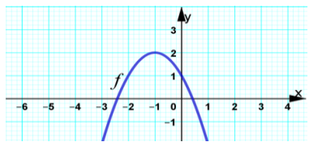
38. In which interval is the function $f(x) = e^{x^3 - 6x^2 + 8}$ increasing ?

A. $]-\infty, 4[$ **B.** $]2, 4[$ **C.** $]0, 4[$ **D.** $]-\infty, 0[\cup]4, +\infty[$

39. Which one is the function of the given graph?

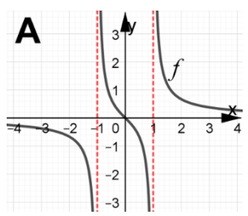
A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$

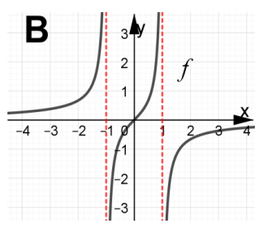


40. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2 - 1}$.

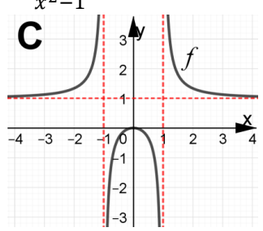
A



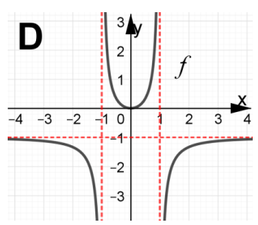
B



C



D

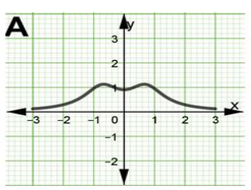


41. The y –intercept of the line $y = -3x - 4$ is :

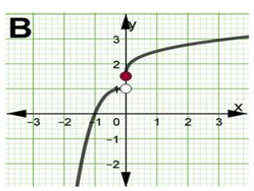
A. $(0, 4)$ **B.** $(0, -4)$ **C.** $(0, 3)$ **D.** $(0, -3)$

42. Which of the following graphs represents a one - to - one function?

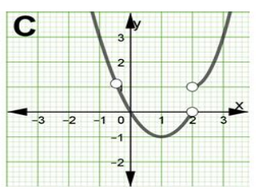
A



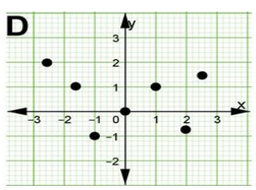
B



C

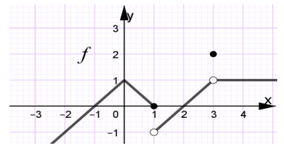


D



43. Use the given graph on the right to find the result of $\lim_{x\to 1^-} f(x)$

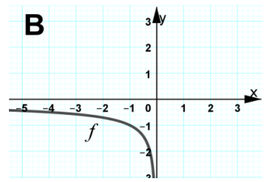
A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



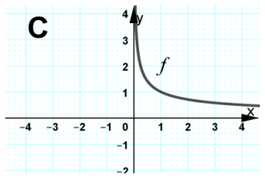
44. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

A

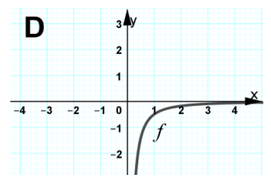
B



C



D



45. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

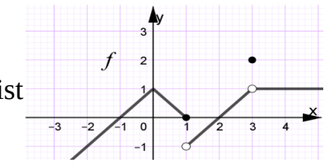
A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

46. Find the equation of the line that passes through the points $(2, 0)$ and $(0, -3)$

A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

47. Use the given graph on the right to find the result of $\lim_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



48. Redefine the function $f(x) = \frac{x^2 - 4x - 12}{x - 6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 4 & x = 6 \end{cases}$

B. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 12 & x = 6 \end{cases}$

C. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 8 & x = 6 \end{cases}$

D. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ -2 & x = 6 \end{cases}$

49. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

50. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

Kurdistan Region – Iraq 0015 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours O 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000015

Answer the following questions : (two marks for each right choice)

1. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

2. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

3. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , t is measured in seconds and S in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

4. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

5. Redefine the function $f(x) = \frac{x^2-4x-12}{x-6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 4 & x = 6 \end{cases}$ **B.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 12 & x = 6 \end{cases}$

C. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 8 & x = 6 \end{cases}$ **D.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ -2 & x = 6 \end{cases}$

6. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim_{x\to1^-} \frac{3}{1-x} = +\infty$

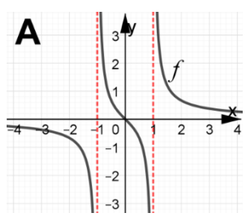
7. Find the second derivative of the function $f(x) = x\ sinx + cosx$.

A. $f''(x) = -x\ sinx + cosx$ **B.** $f''(x) = x\ cosx + 2sinx$

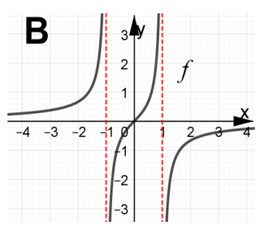
C. $f''(x) = -x\ cosx + sinx$ **D.** $f''(x) = x\ sinx - 2cosx$

8. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.

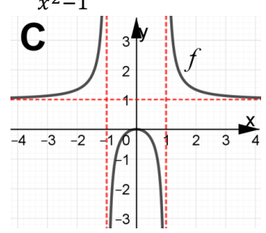
A



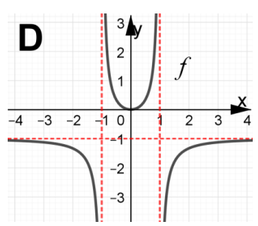
B



C



D



9. Find the value of (a) so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \geq 0 \end{cases}$ will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

10. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

11. Which of the following functions achieves the behavior:
$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to +\infty$

A. $f(x) = x^3 - 2x^2 + 1$ **B.** $f(x) = x^2 - 2x^3 + 1$

C. $f(x) = x^4 - 2x^3 + 1$ **D.** $f(x) = x^3 - 2x^4 + 1$

12. The range of which of the following functions is $]-\infty,-2\,]$?

A. $f(x) = -\sqrt{x} - 2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x} - 2$

13. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

14. If $3 - (\frac{1}{4}x - 1)^3 \leq f(x) \leq 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim_{x\to4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

15. Which of the following is false ?

A. The distance between the point $(3\,,-7\,)$ and the line $y = 5$ is 12 .

B. The lines $3x + 4y = 10$ and $4x - 3y = 14$ are perpendicular .

C. The domain of the function $f(x) = \frac{-2x}{3x-2}$ is $R - \left\{\frac{2}{3}\right\}$.

D. The graph of the function $f(x) = |x + 4|$ is symmetric with respect to the y −axis .

16. The result of $\lim_{x\to2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

17. Find the result of $\lim_{x\to1} \frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

18. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

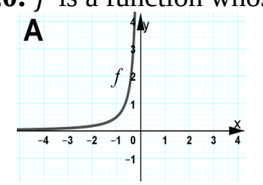
C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

19. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

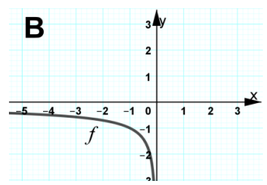
A. $y = \frac{-3}{4}x + 8$ **B.** $y = \frac{3}{4}x + 2$ **C.** $y = \frac{3}{4}x - 7$ **D.** $y = \frac{1}{4}x + 4$

20. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

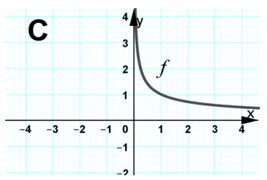
A



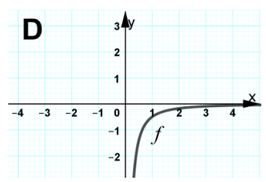
B



C



D



21. Find the critical value of the function $f(x) = x^3 + 6x - 5$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

22. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

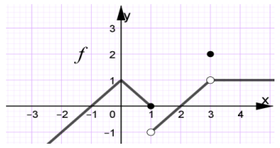
A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

23. Find the value of (b) so that the points $(3\,,-4\,)$, $(2\,,b\,)$ and $(1\,,2\,)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

24. Use the given graph on the right to find the result of $\lim_{x\to 1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



25. If $f(x)=\frac{-4}{5-x}$ then the result of $\lim_{\Delta x\to 0}\frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

26. The result of $\lim_{x\to 3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

27. Find the derivative of the function $f(x)=\ln x^2$.

A. $f'(x)=\frac{1}{2x}$ **B.** $f'(x)=\frac{2}{x}$ **C.** $f'(x)=\frac{1}{x}$ **D.** $f'(x)=2\ln x$

28. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between -2 and 0 .

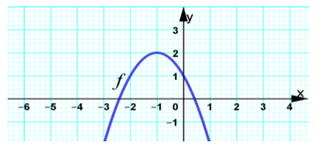
A. $f(x)=\frac{x-1}{x+1}$ **B.** $f(x)=x^2-3x+2$

C. $f(x)=2x^2+3x-3$ **D.** $f(x)=2x^3-2x+1$

29. Which one is the function of the given graph?

A. $f(x)=-(x+1)^2-2$ **B.** $f(x)=-(x+1)^2+2$

C. $f(x)=-(x-1)^2+2$ **D.** $f(x)=-(x-1)^2-2$



30. Which of the following function is odd ?

A. $f(x)=2x\,sinx$ **B.** $f(x)=\frac{3}{x^2}$ **C.** $f(x)=\frac{x}{|x|}$ **D.** $f(x)=x+cosx$

31. The result of $\lim_{x\to 4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

32. In which interval is the function $f(x)=e^{\,x^3-6x^2+8}$ increasing ?

A. $]-\infty,4[$ **B.** $]2,4[$ **C.** $]0,4[$ **D.** $]-\infty,0[\cup]4,+\infty[$

33. Find the derivative of the function $f(x)=\frac{x}{\sqrt{x^4+1}}$.

A. $f'(x)=\frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x)=\frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x)=\frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x)=\frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

34. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x+y=-5$.

A. $y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

35. The result of $\lim_{x\to-\infty}\frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

36. The points of intersection of the functions $f(x)=x^2+2x$ *and* $g(x)=x+2$. is

A. $\begin{cases}(1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\(-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\ ,-1)\\(2\ ,\ 4)\end{cases}$

37. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\ ,0)$ **B.** $(1\ ,2)$ **C.** $(0\ ,2)$ **D.** $(-1\ ,2)$

38. Determine the table of the function $f(x)=C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

39. The function $f(x)=\begin{cases}x & x<1\\ 2 & x=1\\ 2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

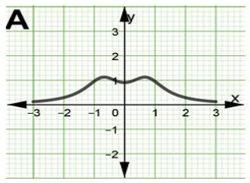
A. $f(1)$ is not defined. **B.** $\lim_{x\to 1} f(x)$ does not exist .

C. $\lim_{x\to 1} f(x)\neq f(1)$ **D.** $\lim_{x\to 1} f(x)=f(1)$

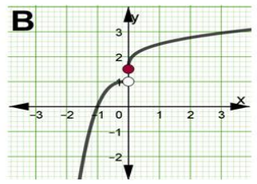
40. Find the result of $\lim_{x\to 0}\frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

41. Which of the following graphs represents a one - to - one function?

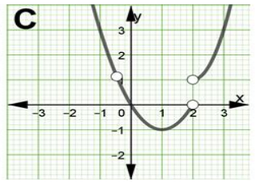
A



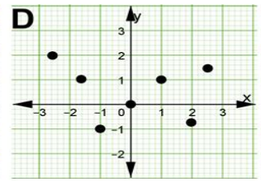
B



C



D



42. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A. x^2-3x+4 **B.** x^2+x-8 **C.** x^2+x **D.** $2x-3$

43. The y –intercept of the line $y=-3x-4$ is :

A. $(0\ ,4\ )$ **B.** $(0\ ,-4\ )$ **C.** $(0\ ,3\ )$ **D.** $(0\ ,-3\ )$

44. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 m^2 B. 850 m^2 C. 784 m^2 D. 824 m^2

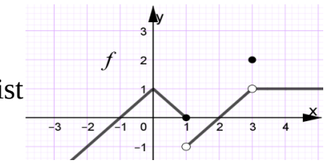
45. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

46. At which value of x the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.** $x=-2$ **C.** $x=6$ **D .** $x=-6$

47. Use the given graph on the right to find the result of $\lim_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



48. If $f(x)=a\,x^3+x$ find the value of a where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

49. Find the horizontal asymptote to the graph of a function $f(x)=\frac{5x^3-2x^2}{1-2x^3}$.

A. $y=\frac{5}{2}$ **B.** $y=-\frac{5}{2}$ **C.** $y=\frac{3}{2}$ **D.** $y=-\frac{3}{2}$

50. Which of the following is true ?

A. $\lim_{x\to 1^+}\frac{-3}{(x-1)^2}=+\infty$ **B.** $\lim_{x\to 0}\frac{\frac{1}{3+x}-\frac{1}{3}}{x}=\frac{1}{9}$ **C.** $\lim_{x\to 0}\frac{\sin 3x}{\sin 2x}=\frac{2}{3}$ **D .** $\lim_{x\to 0}\frac{1-cosx}{sinx}=0$

Kurdistan Region – Iraq 0016 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours P 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000016

Answer the following questions : (two marks for each right choice)

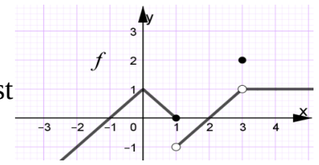
1. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

2. The result of $\lim\limits_{x\to-\infty}\frac{3x}{4\cos x-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

3. Use the given graph on the right to find the result of $\lim\limits_{x\to3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



4. The points of intersection of the functions $f(x)=x^2+2x$ *and* $g(x)=x+2$. is

A. $\begin{cases}(1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\(-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\ ,-1)\\(2\ ,\ 4)\end{cases}$

5. Find the result of $\lim\limits_{x\to0}\frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

6. Find the derivative of the function $f(x)=\ln x^2$.

A. $f'(x)=\frac{1}{2x}$ **B.** $f'(x)=\frac{2}{x}$ **C.** $f'(x)=\frac{1}{x}$ **D.** $f'(x)=2\ln x$

7. Find the domain of the function $f(x)=-\sqrt{x^2-3x-10}$.

A. $[-2\ ,5\ ]$ **B.** $]-\infty,-2\ ]\cup[5\ ,+\infty[$ **C.** $[-5\ ,2\ ]$ **D.** $]-\infty,-5\ ]\cup[2\ ,+\infty[$

8. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

9. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

10. Find the value of ($\boldsymbol{b}$) so that the points $(3\ ,-4\ )$, $(2\ ,\boldsymbol{b}\ )$ and $(1\ ,2\ )$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

11. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

12. Find the result of $\lim\limits_{x\to1}\frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

13. Find the critical value of the function $\boldsymbol{f(x)=x^3+6x-5}$

A. $x=-1$ **B.** $x=1$ **C.** $x=2$ **D.** *None*

14. If $f(x)=a\,x^3+x$ find the value of $\boldsymbol{a}$ where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

15. Find the rate of change of the distance between a particle moving on the parabola $y=x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt}=2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

16. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

17. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

18. If $f(x)=\frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to0}\frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

19. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between $\boldsymbol{-2}$ and $\boldsymbol{0}$.

A. $f(x)=\frac{x-1}{x+1}$ **B.** $f(x)=x^2-3x+2$

C. $f(x)=2x^2+3x-3$ **D.** $f(x)=2x^3-2x+1$

20. Which of the following is false ?

A. The distance between the point ($\boldsymbol{3}$, $\boldsymbol{-7}$) and the line $\boldsymbol{y=5}$ is $\boldsymbol{12}$.

B. The lines $\boldsymbol{3x+4y=10}$ and $\boldsymbol{4x-3y=14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x)=\frac{-2x}{3x-2}}$ is $\boldsymbol{R-\left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x)=|x+4|}$ is symmetric with respect to the y –axis .

21. Determine the table of the function $f(x)=\mathrm{C}\sqrt{|\,x\,|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

22. The result of $\lim\limits_{x\to3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

23. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x+y=-5$.

A. $y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

24. The y –intercept of the line $y=-3x-4$ is :

A. $(0\ ,4\ )$ **B.** $(0\ ,-4\ )$ **C.** $(0\ ,3\ )$ **D.** $(0\ ,-3\ )$

25. Find the second derivative of the function $f(x)=x\,\sin x+\cos x$.

A. $f''(x)=-x\,\sin x+\cos x$ **B.** $f''(x)=x\,\cos x+2\sin x$

C. $f''(x)=-x\,\cos x+\sin x$ **D.** $f''(x)=x\,\sin x-2\cos x$

26. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.** $\boldsymbol{x=-2}$ **C.** $x=6$ **D .** $x=-6$

27. The result of $\lim\limits_{x\to2}\frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

28. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A. x^2-3x+4 **B.** x^2+x-8 **C.** x^2+x **D.** $2x-3$

29. Find the value of $(\boldsymbol{a})$ so that the function $f(x)=\begin{cases}x^3+\frac{1}{2} & x<0\\ 4(x^2+a) & x\geq0\end{cases}$

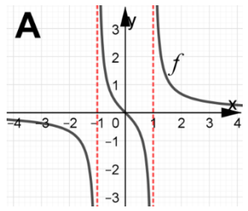
will be continuous at $x=0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

30. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\ ,0)$ **B.** $(1\ ,2)$ **C.** $(0\ ,2)$ **D.** $(-1\ ,2)$

31. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x)=\frac{x}{x^2-1}$.

A



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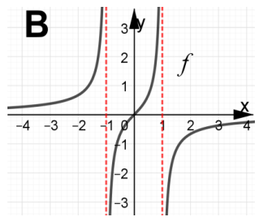
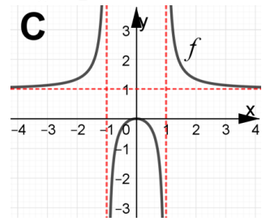
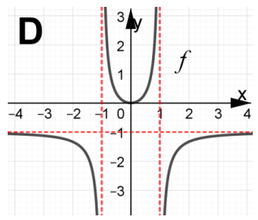


C



D



32. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

33. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x})=3$ **B.** $\frac{d}{dx}(\pi^2-3)=2\pi$ **C.** $\lim_{x\to-\infty}\frac{\sqrt{x^2+x}}{-2x}=\frac{1}{2}$ **D.** $\lim_{x\to1^-}\frac{3}{1-x}=+\infty$

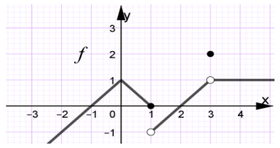
34. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x)=x^2-1$, $g(x)=2x-1$ **B.** $f(x)=1-x^2$, $g(x)=2x+1$

C. $f(x)=1-x$, $g(x)=2x^2+1$ **D.** $f(x)=2x+1$, $g(x)=x^2-1$

35. Use the given graph on the right to find the result of $\lim_{x\to1^-}f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



36. In which interval is the function $f(x)=e^{x^3-6x^2+8}$ increasing ?

A. $]-\infty,4[$ **B.** $]2,4[$ **C.** $]0,4[$ **D.** $]-\infty,0[\cup]4,+\infty[$

37. The range of which of the following functions is $]-\infty,-2]$?

A. $f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.** $f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

38. Find the equation of the line that passes through the points $(2,0)$ and $(0,-3)$

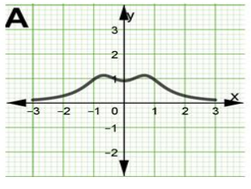
A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

39. If $3-(\frac{1}{4}x-1)^3\le f(x)\le3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim_{x\to4}f(x)$

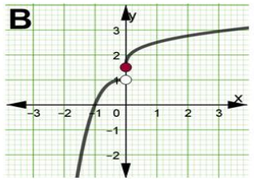
A. 3 **B.** 2 **C.** 4 **D.** 0

40. Which of the following graphs represents a one - to - one function?

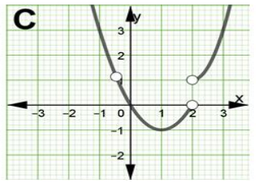
A



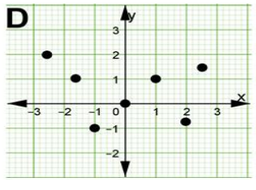
B



C



D



41. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to+\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$

C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

42. Which of the following function is odd ?

A. $f(x)=2x\ sinx$ **B.** $f(x)=\frac{3}{x^2}$ **C.** $f(x)=\frac{x}{|x|}$ **D.** $f(x)=x+cosx$

43. Find the derivative of the function $f(x)=\frac{x}{\sqrt{x^4+1}}$.

A. $f'(x)=\frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x)=\frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x)=\frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x)=\frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

44. The result of $\lim_{x\to4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

45. Find the horizontal asymptote to the graph of a function $f(x)=\frac{5x^3-2x^2}{1-2x^3}$.

A. $y=\frac{5}{2}$ **B.** $y=-\frac{5}{2}$ **C.** $y=\frac{3}{2}$ **D.** $y=-\frac{3}{2}$

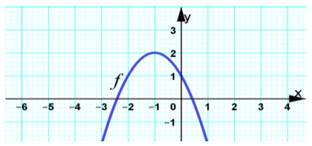
46. Which of the following is true ?

A. $\lim_{x\to1^+}\frac{-3}{(x-1)^2}=+\infty$ **B.** $\lim_{x\to0}\frac{\frac{1}{3+x}-\frac{1}{3}}{x}=\frac{1}{9}$ **C.** $\lim_{x\to0}\frac{\sin3x}{\sin2x}=\frac{2}{3}$ **D.** $\lim_{x\to0}\frac{1-cosx}{sinx}=0$

47. Which one is the function of the given graph?

A. $f(x)=-(x+1)^2-2$ **B.** $f(x)=-(x+1)^2+2$

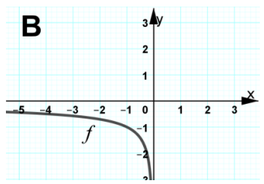
C. $f(x)=-(x-1)^2+2$ **D.** $f(x)=-(x-1)^2-2$



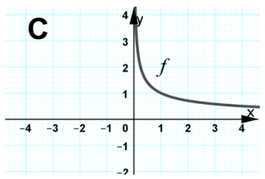
48. f is a function whose derivative is an increasing function, find a graph of f where $f'<0$

A

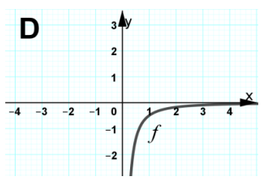
B



C



D



49. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 12 & x=6\end{cases}$

C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ -2 & x=6\end{cases}$

50. The function $f(x)=\begin{cases}x & x<1\\ 2 & x=1\\ 2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim_{x\to1}f(x)$ does not exist .

C. $\lim_{x\to1}f(x)\neq f(1)$ **D.** $\lim_{x\to1}f(x)=f(1)$

Kurdistan Region – Iraq 0017 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours Q 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000017

Answer the following questions : (two marks for each right choice)

1. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2, 5]$ **B.** $]-\infty, -2] \cup [5, +\infty[$ **C.** $[-5, 2]$ **D.** $]-\infty, -5] \cup [2, +\infty[$

2. If $3 - (\frac{1}{4}x - 1)^3 \le f(x) \le 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim_{x\to 4} f(x)$

A. 3 **B.** 2 **C.** 4 **D.** 0

3. The points of intersection of the functions $f(x) = x^2 + 2x \text{ and } g(x) = x + 2$. is

A. $\begin{cases}(1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\(-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\ ,-1)\\(2\ ,\ 4)\end{cases}$

4. Find the equation of the line that passes through the points $(2, 0)$ and $(0, -3)$

A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

5. Find the value of ($\boldsymbol{b}$) so that the points $(3, -4)$, $(2, \boldsymbol{b})$ and $(1, 2)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

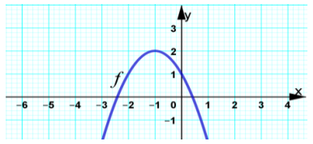
6. Which of the following function is odd ?

A. $f(x) = 2x\ sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

7. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



8. Find the result of $\lim_{x\to 1} \frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

9. Which of the following is true ?

A. $\lim_{x\to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim_{x\to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim_{x\to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D** $\lim_{x\to 0} \frac{1-cosx}{sinx} = 0$

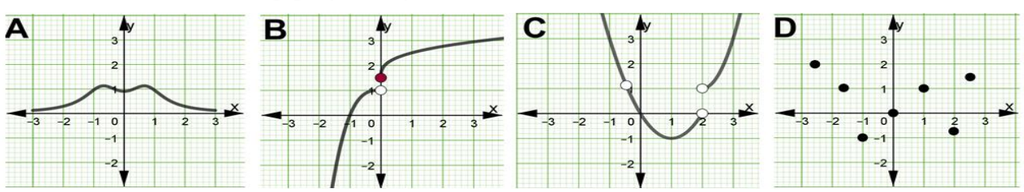
10. The result of $\lim_{x\to 3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

11. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim_{\Delta x\to 0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

12. Find the critical value of the function $\boldsymbol{f(x) = x^3 + 6x - 5}$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

13. Which of the following graphs represents a one - to - one function?



14. The y –intercept of the line $y = -3x - 4$ is :

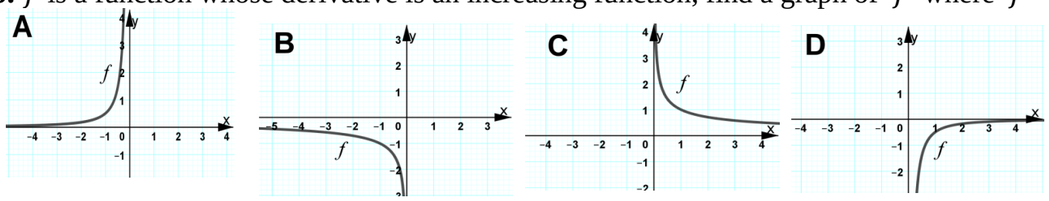
A. $(0, 4)$ **B.** $(0, -4)$ **C.** $(0, 3)$ **D.** $(0, -3)$

15. Find the second derivative of the function $f(x) = x\ sinx + cosx$.

A. $f''(x) = -x\ sinx + cosx$ **B.** $f''(x) = x\ cosx + 2sinx$

C. $f''(x) = -x\ cosx + sinx$ **D.** $f''(x) = x\ sinx - 2cosx$

16. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$



17. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

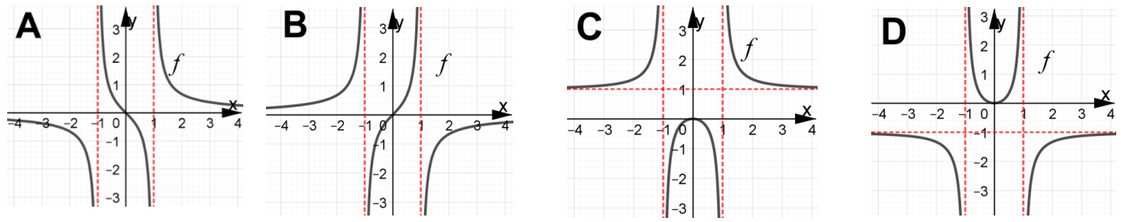
A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

18. Find the result of $\lim_{x\to 0} \frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

19. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :

A. $y = 3x + 8$ **B.** $y = 3x - 8$ **C.** $y = x + 3$ **D.** $y = x - 3$

20. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.



21. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

22. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

23. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ \ln x$

24. Redefine the function $f(x) = \frac{x^2-4x-12}{x-6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases}\frac{x^2-4x-12}{x-6} & x \ne 6\\ 4 & x = 6\end{cases}$ **B.** $h(x) = \begin{cases}\frac{x^2-4x-12}{x-6} & x \ne 6\\ 12 & x = 6\end{cases}$

C. $h(x) = \begin{cases}\frac{x^2-4x-12}{x-6} & x \ne 6\\ 8 & x = 6\end{cases}$ **D.** $h(x) = \begin{cases}\frac{x^2-4x-12}{x-6} & x \ne 6\\ -2 & x = 6\end{cases}$

25. The function $f(x)=\begin{cases} x & x<1 \\ 2 & x=1 \\ 2x-1 & x>1 \end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to 1} f(x)$ does not exist .

C. $\lim\limits_{x\to 1} f(x)\neq f(1)$ **D.** $\lim\limits_{x\to 1} f(x)=f(1)$

26. Find the rate of change of the distance between a particle moving on the parabola $y=x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt}=2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

27. The range of which of the following functions is $]-\infty,-2\,]$?

A. $f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.** $f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

28. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

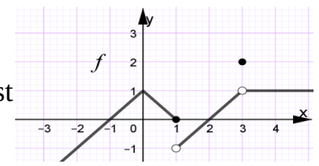
A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

29. If $f(x)=a\,x^3+x$ find the value of $\boldsymbol{a}$ where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

30. Use the given graph on the right to find the result of $\lim\limits_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



31. Find the value of $(\boldsymbol{a})$ so that the function $f(x)=\begin{cases} x^3+\frac{1}{2} & x<0 \\ 4(x^2+a) & x\geq 0 \end{cases}$ will be continuous at $x=0$.

A. $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

32. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

33. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

34. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.** $\boldsymbol{x=-2}$ **C.** $x=6$ **D .** $x=-6$

35. The result of $\lim\limits_{x\to 4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

36. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

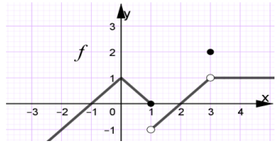
A. $f(x)=x^2-1$, $g(x)=2x-1$ **B.** $f(x)=1-x^2$, $g(x)=2x+1$

C. $f(x)=1-x$, $g(x)=2x^2+1$ **D.** $f(x)=2x+1$, $g(x)=x^2-1$

37. The result of $\lim\limits_{x\to-\infty}\frac{3x}{4\cos x-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

38. Use the given graph on the right to find the result of $\lim\limits_{x\to 1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



39. Determine the table of the function $f(x)=C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

40. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x})=3$ **B.** $\frac{d}{dx}(\pi^2-3)=2\pi$ **C.** $\lim\limits_{x\to-\infty}\frac{\sqrt{x^2+x}}{-2x}=\frac{1}{2}$ **D.** $\lim\limits_{x\to 1^-}\frac{3}{1-x}=+\infty$

41. The result of $\lim\limits_{x\to 2}\frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

42. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$

C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

43. In which interval is the function $f(x)=e^{\,x^3-6x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.** $]-\infty\,,0\,[\cup]4\,,+\infty[$

44. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

45. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

46. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

47. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between $\boldsymbol{-2}$ and $\boldsymbol{0}$.

A. $f(x)=\frac{x-1}{x+1}$ **B.** $f(x)=x^2-3x+2$

C. $f(x)=2x^2+3x-3$ **D.** $f(x)=2x^3-2x+1$

48. Which of the following is false ?

A. The distance between the point $(\boldsymbol{3}\,,\boldsymbol{-7})$ and the line $\boldsymbol{y=5}$ is $\boldsymbol{12}$.

B. The lines $\boldsymbol{3x+4y=10}$ and $\boldsymbol{4x-3y=14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x)=\frac{-2x}{3x-2}}$ is $\boldsymbol{R-\left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x)=|x+4|}$ is symmetric with respect to the $y-$axis .

49. Find the equation of the line that passes through the point $(-2\,,5)$ and that is parallel to the line $3x+y=-5$.

A. $y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

50. Find the horizontal asymptote to the graph of a function $f(x)=\frac{5x^3-2x^2}{1-2x^3}$.

A. $y=\frac{5}{2}$ **B.** $y=-\frac{5}{2}$ **C.** $y=\frac{3}{2}$ **D.** $y=-\frac{3}{2}$

Kurdistan Region – Iraq 0018 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours R

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000018 71027

Answer the following questions : (two marks for each right choice)

1. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq 6\\ 12 & x=6\end{cases}$

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2. If $f(x)=a\,x^3+x$ find the value of $\boldsymbol{a}$ where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

3. The points of intersection of the functions $f(x)=x^2+2x \text{ and } g(x)=x+2.$ is

A. $\begin{cases}(1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\(-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\ ,-1)\\(2\ ,\ 4)\end{cases}$

4. Find the critical value of the function $\boldsymbol{f(x)=x^3+6x-5}$

A. $x=-1$ **B.** $x=1$ **C.** $x=2$ **D.** $None$

5. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

6. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x)=x^2-1\ ,\ g(x)=2x-1$ **B.** $f(x)=1-x^2\ ,\ g(x)=2x+1$

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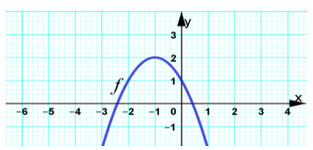
7. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A. x^2-3x+4 **B.** x^2+x-8 **C.** x^2+x **D.** $2x-3$

8. Which one is the function of the given graph?

A. $f(x)=-(x+1)^2-2$ **B.** $f(x)=-(x+1)^2+2$

C. $f(x)=-(x-1)^2+2$ **D.** $f(x)=-(x-1)^2-2$



9. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\ ,0)$ **B.** $(1\ ,2)$ **C.** $(0\ ,2)$ **D.** $(-1\ ,2)$

10. Which of the following is true ?

A. $\lim\limits_{x\to 1^+}\frac{-3}{(x-1)^2}=+\infty$ **B.** $\lim\limits_{x\to 0}\frac{\frac{1}{3+x}-\frac{1}{3}}{x}=\frac{1}{9}$ **C.** $\lim\limits_{x\to 0}\frac{\sin 3x}{\sin 2x}=\frac{2}{3}$ **D .** $\lim\limits_{x\to 0}\frac{1-cosx}{sinx}=0$

11. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between -2 and 0 .

A. $f(x)=\frac{x-1}{x+1}$ **B.** $f(x)=x^2-3x+2$

C. $f(x)=2x^2+3x-3$ **D.** $f(x)=2x^3-2x+1$

12. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

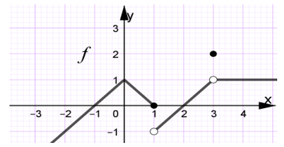
A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

13. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

14. Use the given graph on the right to find the result of $\lim\limits_{x\to 1^-}f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



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16. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x})=3$ **B.** $\frac{d}{dx}(\pi^2-3)=2\pi$ **C.** $\lim\limits_{x\to-\infty}\frac{\sqrt{x^2+x}}{-2x}=\frac{1}{2}$ **D.** $\lim\limits_{x\to 1^-}\frac{3}{1-x}=+\infty$

17. Find the rate of change of the distance between a particle moving on the parabola $y=x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt}=2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

18. Find the second derivative of the function $f(x)=x\,sinx+cosx$.

A. $f''(x)=-x\,sinx+cosx$ **B.** $f''(x)=x\,cosx+2sinx$

C. $f''(x)=-x\,cosx+sinx$ **D.** $f''(x)=x\,sinx-2cosx$

19. The y –intercept of the line $y=-3x-4$ is :

A. $(0\ ,4)$ **B.** $(0\ ,-4)$ **C.** $(0\ ,3)$ **D.** $(0\ ,-3)$

20. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.** $\boldsymbol{x}=-2$ **C.** $x=6$ **D .** $x=-6$

21. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

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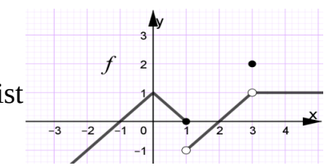
22. If $f(x)=\frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to 0}\frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

23. Use the given graph on the right to find the result of $\lim\limits_{x\to 3}f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



24. Find the value of $(\boldsymbol{a})$ so that the function $f(x)=\begin{cases}x^3+\frac{1}{2} & x<0\\ 4(x^2+a) & x\geq 0\end{cases}$ will be continuous at $x=0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

25. If $3-(\frac{1}{4}x-1)^3\leq f(x)\leq 3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to 4}f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

26. Find the equation of the line that passes through the points $(2\ ,0)$ and $(0\ ,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

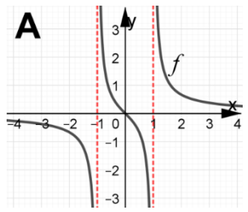
27. Find the result of $\lim_{x\to 1}\frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

28. In which interval is the function $f(x)=e^{x^3-6x^2+8}$ increasing ?

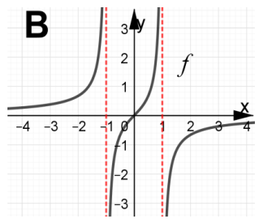
A. $]-\infty,4[$ **B.** $]2,4[$ **C.** $]0,4[$ **D.** $]-\infty,0[\cup]4,+\infty[$

29. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x)=\frac{x}{x^2-1}$.

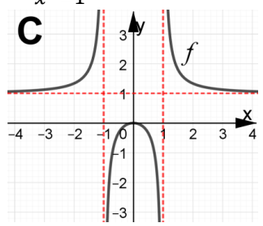
A



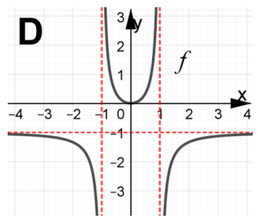
B



C



D



30. Determine the table of the function $f(x)=C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

31. Find the horizontal asymptote to the graph of a function $f(x)=\frac{5x^3-2x^2}{1-2x^3}$.

A. $y=\frac{5}{2}$ **B.** $y=-\frac{5}{2}$ **C.** $y=\frac{3}{2}$ **D.** $y=-\frac{3}{2}$

32. Find the derivative of the function $f(x)=\frac{x}{\sqrt{x^4+1}}$.

A. $f'(x)=\frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x)=\frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x)=\frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x)=\frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

33. The result of $\lim_{x\to-\infty}\frac{3x}{4\cos x-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

34. The result of $\lim_{x\to 3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

35. The result of $\lim_{x\to 2}\frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

36. The result of $\lim_{x\to 4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

37. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$ ، $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$

C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

38. Which of the following function is odd ?

A. $f(x)=2x\sin x$ **B.** $f(x)=\frac{3}{x^2}$ **C.** $f(x)=\frac{x}{|x|}$ **D.** $f(x)=x+\cos x$

39. Find the result of $\lim_{x\to 0}\frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

40. The range of which of the following functions is $]-\infty,-2]$?

A. $f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.** $f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

41. Find the derivative of the function $f(x)=\ln x^2$.

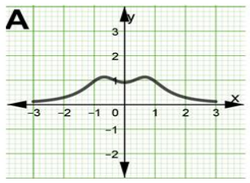
A. $f'(x)=\frac{1}{2x}$ **B.** $f'(x)=\frac{2}{x}$ **C.** $f'(x)=\frac{1}{x}$ **D.** $f'(x)=2\ln x$

42. Find the domain of the function $f(x)=-\sqrt{x^2-3x-10}$.

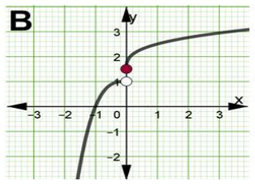
A. $[-2,5]$ **B.** $]-\infty,-2]\cup[5,+\infty[$ **C.** $[-5,2]$ **D.** $]-\infty,-5]\cup[2,+\infty[$

43. Which of the following graphs represents a one - to - one function?

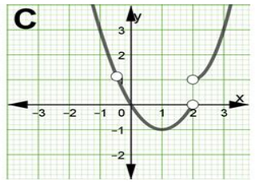
A



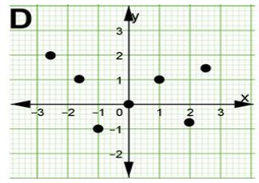
B



C



D



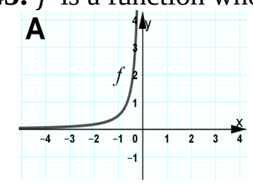
44. The function $f(x)=\begin{cases}x & x<1\\ 2 & x=1\\ 2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim_{x\to 1} f(x)$ does not exist .

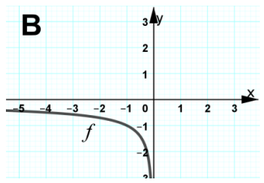
C. $\lim_{x\to 1} f(x)\neq f(1)$ **D.** $\lim_{x\to 1} f(x)=f(1)$

45. f is a function whose derivative is an increasing function, find a graph of f where $f'<0$

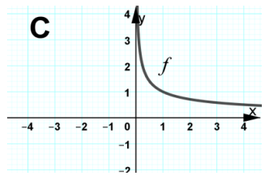
A



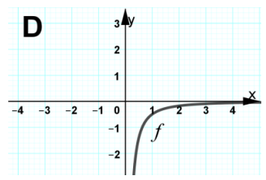
B



C



D



46. Find the equation of the line that passes through the point $(-2,5)$ and that is parallel to the line $3x+y=-5$.

A. $y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

47. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

48. What is the maximum area of a rectangle whose perimeter is ($112\ m$) ?

A. $688\ \boldsymbol{m^2}$ B. $850\ \boldsymbol{m^2}$ C. $784\ \boldsymbol{m^2}$ D. $824\ \boldsymbol{m^2}$

49. Which of the following is false ?

A. The distance between the point $(\mathbf{3},\mathbf{-7})$ and the line $\boldsymbol{y=5}$ is $\mathbf{12}$.

B. The lines $\boldsymbol{3x+4y=10}$ and $\boldsymbol{4x-3y=14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x)=\frac{-2x}{3x-2}}$ is $\boldsymbol{R-\left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x)=|x+4|}$ is symmetric with respect to the $y-$axis .

50. Find the value of ($\boldsymbol{b}$) so that the points $(3,-4)$, $(2,\boldsymbol{b})$ and $(1,2)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

Kurdistan Region – Iraq 0019 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours S 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

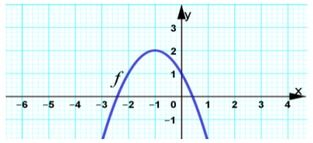
SN: 400000019

Answer the following questions : (two marks for each right choice)

1. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



2. The result of $\lim\limits_{x\to 2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

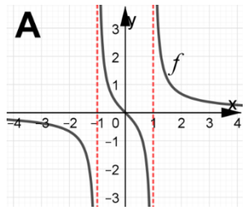
3. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

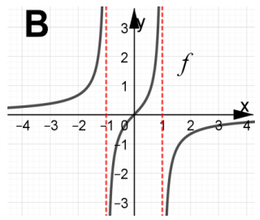
C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

4. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.

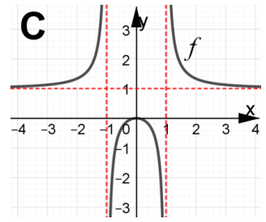
A



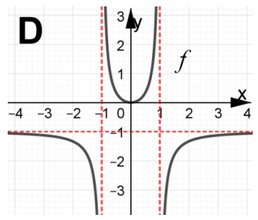
B



C



D



5. Find the domain of the function $f(x) = -\sqrt{x^2-3x-10}$.

A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

6. The result of $\lim\limits_{x\to-\infty} \frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

7. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to 0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

8. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x+y=-5$.

A. $y = 3x+11$ **B.** $y = -3x-1$ **C.** $y = 3x-11$ **D.** $y = -3x+1$

9. Find the value of ($\boldsymbol{b}$) so that the points $(3\,,-4\,)$, $(2\,,\boldsymbol{b}\,)$ and $(1\,,2\,)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

10. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between $-\mathbf{2}$ and $\mathbf{0}$.

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2-3x+2$

C. $f(x) = 2x^2+3x-3$ **D.** $f(x) = 2x^3-2x+1$

11. In which interval is the function $f(x) = e^{\,x^3-6\,x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.** $]-\infty\,,0\,[\cup]4\,,+\infty[$

12. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2}+n$ **B.** $x = \frac{\pi}{2}+n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

13. Find the rate of change of the distance between a particle moving on the parabola $y = x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

14. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

15. The range of which of the following functions is $]-\infty,-2\,]$?

A. $f(x) = -\sqrt{x}-2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x}-2$

16. The result of $\lim\limits_{x\to 4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

17. Determine the table of the function $f(x) = C\sqrt{|\,x\,|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

18. What is the maximum area of a rectangle whose perimeter is ($112\ m$) ?

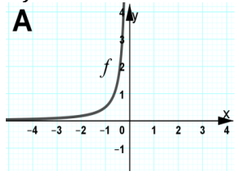
A. $688\ \boldsymbol{m^2}$ B. $850\ \boldsymbol{m^2}$ C. $784\ \boldsymbol{m^2}$ D. $824\ \boldsymbol{m^2}$

19. Which of the following is true ?

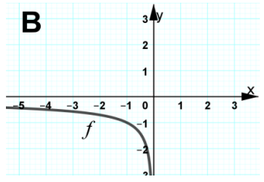
A. $\lim\limits_{x\to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim\limits_{x\to 0} \frac{\frac{1}{3+x}-\frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim\limits_{x\to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D.** $\lim\limits_{x\to 0} \frac{1-cosx}{sinx} = 0$

20. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

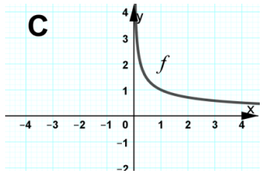
A



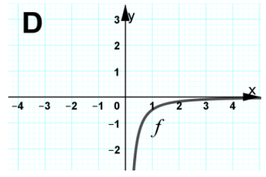
B



C



D



21. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

22. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

23. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to +\infty$

A. $f(x) = x^3-2x^2+1$ **B.** $f(x) = x^2-2x^3+1$

C. $f(x) = x^4-2x^3+1$ **D.** $f(x) = x^3-2x^4+1$

24. Find the point of inflection for the function $f(x) = x^3-x+2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

25. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x=4$.

A. $y = \frac{-3}{4}x+8$ **B.** $y = \frac{3}{4}x+2$ **C.** $y = \frac{3}{4}x-7$ **D.** $y = \frac{1}{4}x+4$

26. At which value of x the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $x = -2$ **C.** $x = 6$ **D .** $x = -6$

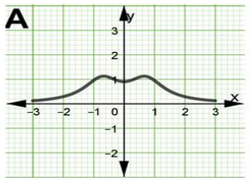
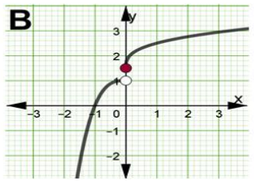
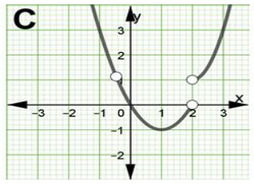
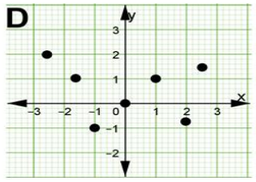
27. If $f(x) = a\,x^3 + x$ find the value of a where $f'(2) = 13$.
A. 2 **B.** -2 **C.** -1 **D.** 1

28. If $3 - (\frac{1}{4}x - 1)^3 \le f(x) \le 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

29. Find the value of (a) so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \ge 0 \end{cases}$ will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

30. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?
A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

31. Which of the following graphs represents a one - to - one function?

A 
B 
C 
D 

32. Which of the following is false ?
A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim\limits_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim\limits_{x\to 1^-} \frac{3}{1-x} = +\infty$

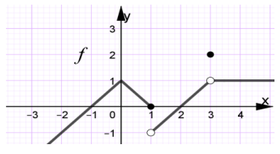
33. Find the second derivative of the function $f(x) = x\,sinx + cosx$.
A. $f''(x) = -x\,sinx + cosx$ **B.** $f''(x) = x\,cosx + 2sinx$
C. $f''(x) = -x\,cosx + sinx$ **D.** $f''(x) = x\,sinx - 2cosx$

34. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :
A. $y = 3x + 8$ **B.** $y = 3x - 8$ **C.** $y = x + 3$ **D.** $y = x - 3$

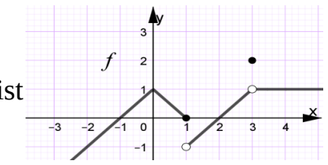
35. Find the derivative of the function $f(x) = \ln x^2$.
A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ln x$

36. Which of the following function is odd ?
A. $f(x) = 2x\,sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

37. The result of $\lim\limits_{x\to 3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

38. Use the given graph on the right to find the result of $\lim\limits_{x\to 1^-} f(x)$
A. 0 **B.** -1 **C.** 1 **D.** Does not exist .


39. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.
A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

40. Use the given graph on the right to find the result of $\lim\limits_{x\to 3} f(x)$
A. 1 **B.** 0 **C.** 2 **D.** Does not exist


41. Find the result of $\lim\limits_{x\to 0} \frac{e^x - 1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

42. Which of the following is false ?
A. The distance between the point (**3** , $-$**7**) and the line $y = 5$ is **12** .
B. The lines $3x + 4y = 10$ and $4x - 3y = 14$ are perpendicular .
C. The domain of the function $f(x) = \frac{-2x}{3x-2}$ is $R - \{\frac{2}{3}\}$.
D. The graph of the function $f(x) = |x + 4|$ is symmetric with respect to the y –axis .

43. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.
A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$
C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

44. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3-2x^2}{1-2x^3}$.
A. y = $\frac{5}{2}$ **B.** y = $-\frac{5}{2}$ **C.** y = $\frac{3}{2}$ **D.** y = $-\frac{3}{2}$

45. The function $f(x) = \begin{cases} x & x < 1 \\ 2 & x = 1 \\ 2x - 1 & x > 1 \end{cases}$ is discontinuous at $x = 1$ because :
A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to 1} f(x)$ does not exist .
C. $\lim\limits_{x\to 1} f(x) \ne f(1)$ **D.** $\lim\limits_{x\to 1} f(x) = f(1)$

46. Redefine the function $f(x) = \frac{x^2-4x-12}{x-6}$ to be continuous at $x = 6$
A. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \ne 6 \\ 4 & x = 6 \end{cases}$ **B.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \ne 6 \\ 12 & x = 6 \end{cases}$
C. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \ne 6 \\ 8 & x = 6 \end{cases}$ **D.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \ne 6 \\ -2 & x = 6 \end{cases}$

47. Find the critical value of the function $f(x) = x^3 + 6x - 5$
A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** *None*

48. The y –intercept of the line $y = -3x - 4$ is :
A. (0 , 4) **B.** (0 , $-$4) **C.** (0 , 3) **D.** (0 , $-$3)

49. The points of intersection of the functions $f(x) = x^2 + 2x$ *and* $g(x) = x + 2$. is
A. {(1 , 3) (2 , 0) **B.** {($-$1 , 3) (2 , 0) **C.** {(1 , 3) ($-$2 , 0) **D.** {($-$1 , $-$1) (2 , 4)

50. Find the result of $\lim\limits_{x\to 1} \frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

Kurdistan Region – Iraq 0020 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours T

71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000020

Answer the following questions : (two marks for each right choice)

1. Find the derivative of the function $f(x)=\frac{x}{\sqrt{x^4+1}}$.

A. $f'(x)=\frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x)=\frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x)=\frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x)=\frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

2. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

3. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x)=x^2-1$, $g(x)=2x-1$ **B.** $f(x)=1-x^2$, $g(x)=2x+1$

C. $f(x)=1-x$, $g(x)=2x^2+1$ **D.** $f(x)=2x+1$, $g(x)=x^2-1$

4. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$

C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

5. The result of $\lim\limits_{x\to-\infty}\frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

6. If $f(x)=\frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to0}\frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

7. In which interval is the function $f(x)=e^{\,x^3-6\,x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.** $]-\infty\,,0\,[\cup\,]4\,,+\infty[$

8. Find the critical value of the function $\boldsymbol{f(x)=x^3+6x-5}$

A. $x=-1$ **B.** $x=1$ **C.** $x=2$ **D.** $None$

9. Find the rate of change of the distance between a particle moving on the parabola $y=x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt}=2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

10. Find the result of $\lim\limits_{x\to0}\frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

11. Find the result of $\lim\limits_{x\to1}\frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

12. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 12 & x=6\end{cases}$

C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ -2 & x=6\end{cases}$

13. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

14. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x+y=-5$.

A. $y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

15. If $f(x)=a\,x^3+x$ find the value of $\boldsymbol{a}$ where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

16. Which of the following is false ?

A. The distance between the point $(\,\mathbf{3}\,,\mathbf{-7}\,)$ and the line $\boldsymbol{y=5}$ is $\mathbf{12}$.

B. The lines $\boldsymbol{3x+4y=10}$ and $\boldsymbol{4x-3y=14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x)=\frac{-2x}{3x-2}}$ is $\boldsymbol{R-\left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x)=|x+4|}$ is symmetric with respect to the y −axis .

17. Find the domain of the function $f(x)=-\sqrt{x^2-3x-10}$.

A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

18. If $3-(\frac{1}{4}x-1)^3\leq f(x)\leq3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to4}f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

19. The result of $\lim\limits_{x\to3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

20. The y –intercept of the line $y=-3x-4$ is :

A. $(0\,,4\,)$ **B.** $(0\,,-4\,)$ **C.** $(0\,,3\,)$ **D.** $(0\,,-3\,)$

21. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

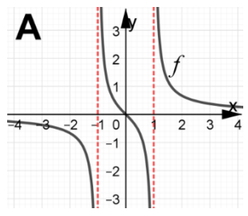
A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

22. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

23. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x)=\frac{x}{x^2-1}$.

A



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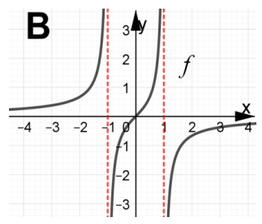

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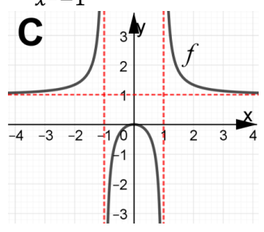

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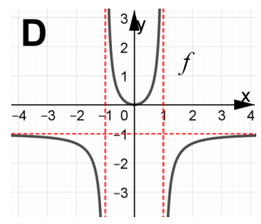
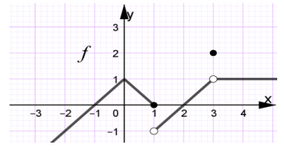


24. What is the maximum area of a rectangle whose perimeter is (112 m) ?

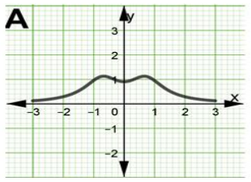
A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

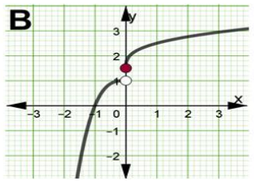
25. Use the given graph on the right to find the result of $\lim\limits_{x\to1^-}f(x)$

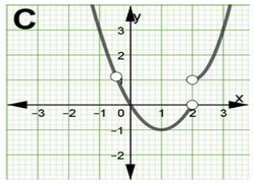
A. 0 **B.** -1 **C.** 1 **D.** Does not exist .

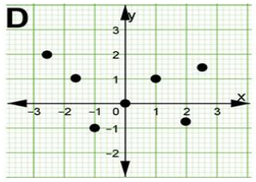


26. Which of the following graphs represents a one - to - one function?

A 

B 

C 

D 

27. The points of intersection of the functions $f(x) = x^2 + 2x \text{ and } g(x) = x + 2$. is

A. $\begin{cases}(1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\(-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\ ,-1)\\(2\ ,\ 4)\end{cases}$

28. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

29. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ln x$

30. The range of which of the following functions is $]-\infty, -2\,]$?

A. $f(x) = -\sqrt{x} - 2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x} - 2$

31. Which of the following function is odd ?

A. $f(x) = 2x\ sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

32. Which of the following is true ?

A. $\lim\limits_{x\to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim\limits_{x\to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim\limits_{x\to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D** .$\lim\limits_{x\to 0} \frac{1-cosx}{sinx} = 0$

33. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , t is measured in seconds and S in meters . Find the average velocity of this point during the first three seconds . (**A.**-5 **B.** 5 **C.**-3 **D.** 3) (m/sec)

34. The result of $\lim\limits_{x\to 4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

35. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim\limits_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim\limits_{x\to 1^-} \frac{3}{1-x} = +\infty$

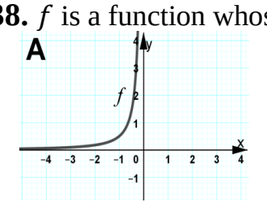
36. Find the value of (a) so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \geq 0 \end{cases}$

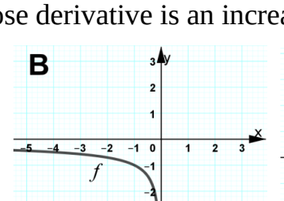
will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D** . $\frac{1}{8}$

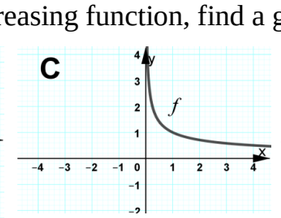
37. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

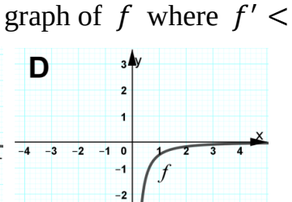
A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

38. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

A 

B 

C 

D 

39. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between -2 and 0 .

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

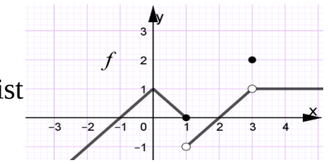
C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

40. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3-2x^2}{1-2x^3}$.

A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

41. Use the given graph on the right to find the result of $\lim\limits_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



42. The function $f(x) = \begin{cases} x & x < 1 \\ 2 & x = 1 \\ 2x - 1 & x > 1 \end{cases}$ is discontinuous at $x = 1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to 1} f(x)$ does not exist .

C. $\lim\limits_{x\to 1} f(x) \neq f(1)$ **D.** $\lim\limits_{x\to 1} f(x) = f(1)$

43. The result of $\lim\limits_{x\to 2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

44. At which value of x the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $x = -2$ **C.** $x = 6$ **D** . $x = -6$

45. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

46. Find the equation of the line that passes through the points $(2\ ,0)$ and $(0\ ,-3)$

A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

47. Find the value of (b) so that the points $(3\ ,-4\ )$, $(2\ ,b\ )$ and $(1\ ,2\ )$ are collinear .

A.-1 **B.** 1 **C.**-2 **D.** 4

48. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

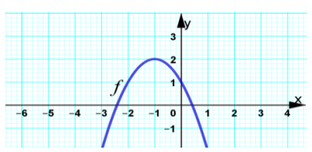
D

x	-4	-1	0	1	4
y	6	3	0	3	6

49. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



50. Find the second derivative of the function $f(x) = x\ sinx + cosx$.

A. $f''(x) = -x\ sinx + cosx$ **B.** $f''(x) = x\ cosx + 2sinx$

C. $f''(x) = -x\ cosx + sinx$ **D.** $f''(x) = x\ sinx - 2cosx$

Kurdistan Region – Iraq 0021 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours U 71027

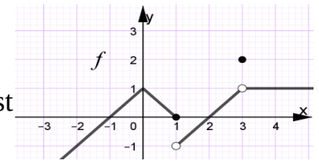
General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000021

Answer the following questions : (two marks for each right choice)

1. Use the given graph on the right to find the result of $\lim\limits_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



2. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

3. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3-2x^2}{1-2x^3}$.

A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

4. The y –intercept of the line $y = -3x - 4$ is :

A. $(0, 4)$ **B.** $(0, -4)$ **C.** $(0, 3)$ **D.** $(0, -3)$

5. Redefine the function $f(x) = \frac{x^2-4x-12}{x-6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 4 & x = 6 \end{cases}$ **B.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 12 & x = 6 \end{cases}$

C. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 8 & x = 6 \end{cases}$ **D.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ -2 & x = 6 \end{cases}$

6. Which of the following is false ?

A. The distance between the point $(3, -7)$ and the line $y = 5$ is 12 .

B. The lines $3x + 4y = 10$ and $4x - 3y = 14$ are perpendicular .

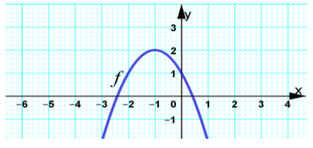
C. The domain of the function $f(x) = \frac{-2x}{3x-2}$ is $R - \left\{\frac{2}{3}\right\}$.

D. The graph of the function $f(x) = |x + 4|$ is symmetric with respect to the y −axis .

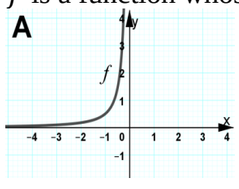
7. Which one is the function of the given graph?

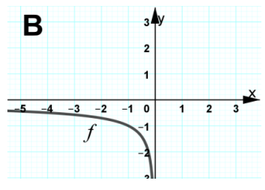
A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

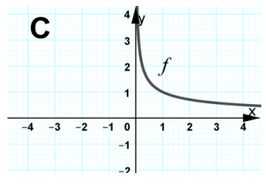
C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$

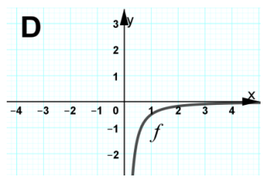


8. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$









9. The result of $\lim\limits_{x\to 2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

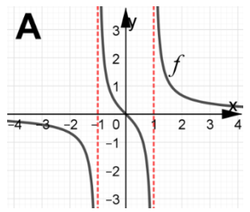
10. In which interval is the function $f(x) = e^{x^3-6x^2+8}$ increasing ?

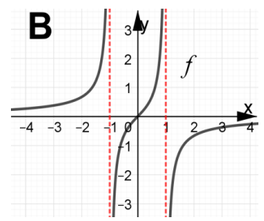
A. $]-\infty, 4[$ **B.** $]2, 4[$ **C.** $]0, 4[$ **D.** $]-\infty, 0[\cup]4, +\infty[$

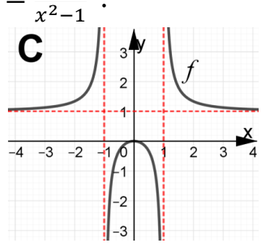
11. Which of the following is true ?

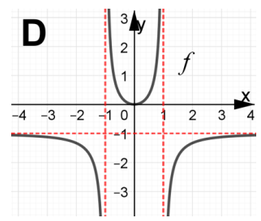
A. $\lim\limits_{x\to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim\limits_{x\to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim\limits_{x\to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D** . $\lim\limits_{x\to 0} \frac{1-cosx}{sinx} = 0$

12. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.









13. Find the value of (a) so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \geq 0 \end{cases}$

will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D** . $\frac{1}{8}$

14. Find the equation of the line that passes through the point $(-2, 5)$ and that is parallel to the line $3x + y = -5$.

A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

15. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to 0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

16. The result of $\lim\limits_{x\to 4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

17. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :

A. $y = 3x + 8$ **B.** $y = 3x - 8$ **C.** $y = x + 3$ **D.** $y = x - 3$

18. Find the result of $\lim\limits_{x\to 0} \frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

19. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

20. If $3 - (\frac{1}{4}x - 1)^3 \leq f(x) \leq 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

21. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

A. $y = \frac{-3}{4}x + 8$ **B.** $y = \frac{3}{4}x + 2$ **C.** $y = \frac{3}{4}x - 7$ **D.** $y = \frac{1}{4}x + 4$

22. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between -2 and 0 .

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

23. Find the critical value of the function $f(x) = x^3 + 6x - 5$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

24. The result of $\lim\limits_{x\to -\infty} \frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

25. The range of which of the following functions is $]-\infty,-2\,]$?

A. $f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.** $f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

26. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to-\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to+\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$

C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

27. Find the value of ($\boldsymbol{b}$) so that the points $(3\,,-4\,)$, $(2\,,\boldsymbol{b}\,)$ and $(1\,,2\,)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

28. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.** $\boldsymbol{x}=-2$ **C.** $x=6$ **D .** $x=-6$

29. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A. x^2-3x+4 **B.** x^2+x-8 **C.** x^2+x **D.** $2x-3$

30. If $f(x)=a\,x^3+x$ find the value of $\boldsymbol{a}$ where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

31. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

32. The points of intersection of the functions $f(x)=x^2+2x\ and\ g(x)=x+2.$ is

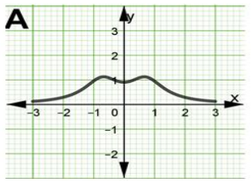
A. $\begin{cases}(1\ ,\ 3\ )\\(2\ ,\ 0\ )\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3\ )\\(2\ ,\ 0\ )\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3\ )\\(-2\ ,\ 0\ )\end{cases}$ **D.** $\begin{cases}(-1\,,-1\,)\\(\ 2\ ,\ 4\ )\end{cases}$

33. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

34. Which of the following graphs represents a one - to - one function?

A



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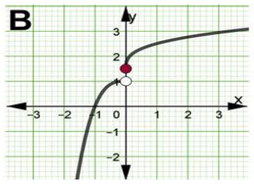

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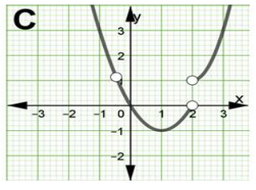
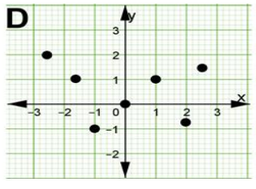
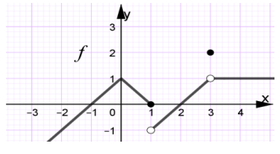


D



35. Use the given graph on the right to find the result of $\lim\limits_{x\to1^-}f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



36. Find the rate of change of the distance between a particle moving on the parabola $y=x^2+1$, and the origin at $x=1$, knowing that $\frac{dx}{dt}=2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

37. Find the domain of the function $f(x)=-\sqrt{x^2-3x-10}$.

A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

38. Which of the following function is odd ?

A. $f(x)=2x\ sinx$ **B.** $f(x)=\frac{3}{x^2}$ **C.** $f(x)=\frac{x}{|\,x\,|}$ **D.** $f(x)=x+cosx$

39. What is the maximum area of a rectangle whose perimeter is ($112\ m$) ?

A. $688\ \boldsymbol{m^2}$ B. $850\ \boldsymbol{m^2}$ C. $784\ \boldsymbol{m^2}$ D. $824\ \boldsymbol{m^2}$

40. Find the derivative of the function $f(x)=\ln x^2$.

A. $f'(x)=\frac{1}{2\,x}$ **B.** $f'(x)=\frac{2}{x}$ **C.** $f'(x)=\frac{1}{x}$ **D.** $f'(x)=2\ln x$

41. Find the second derivative of the function $f(x)=x\ sinx+cosx$.

A. $f''(x)=-x\ sinx+cosx$ **B.** $f''(x)=x\ cosx+2sinx$

C. $f''(x)=-x\ cosx+sinx$ **D.** $f''(x)=x\ sinx-2cosx$

42. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x})=3$ **B.** $\frac{d}{dx}(\,\pi^2-3)=2\pi$ **C.** $\lim\limits_{x\to-\infty}\frac{\sqrt{x^2+x}}{-2\,x}=\frac{1}{2}$ **D.** $\lim\limits_{x\to1^-}\frac{3}{1-x}=+\infty$

43. The result of $\lim\limits_{x\to3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

44. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

45. Determine the table of the function $f(x)=\mathrm{C}\sqrt{|\,x\,|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

46. The function $f(x)=\begin{cases}x & x<1\\2 & x=1\\2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to1}f(x)$ does not exist .

C. $\lim\limits_{x\to1}f(x)\neq f(1)$ **D.** $\lim\limits_{x\to1}f(x)=f(1)$

47. Find the result of $\lim\limits_{x\to1}\frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

48. The population of a city was $(3\ 687\ 000)$ in the year 2003 and $(\ 4\ 042\ 000)$ in the year 2013 What was the average rate of the population?

A. $45\ 500$ **B.** $35\ 500$ **C.** $25\ 500$ **D.** $15\ 500$

49. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

50. Find the derivative of the function $f(x)=\frac{x}{\sqrt{x^4+1}}$.

A. $f'(x)=\frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x)=\frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x)=\frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x)=\frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

Kurdistan Region – Iraq 0022 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours V

71027

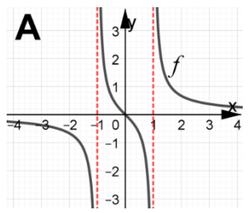
General exams for preparatory stage For the Academic year (2020-2021) Second attempt

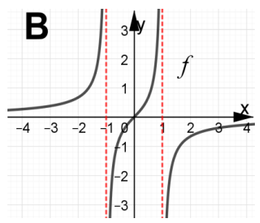
SN: 400000022

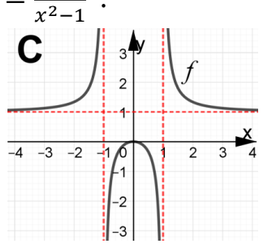
Answer the following questions : (two marks for each right choice)

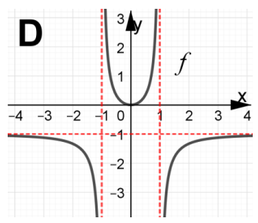
1. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , t is measured in seconds and S in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

2. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.

A 

B 

C 

D 

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5. The result of $\lim_{x\to 2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

6. Find the result of $\lim_{x\to 1} \frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

7. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

8. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between -2 and 0 .

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

9. The range of which of the following functions is $]-\infty, -2\,]$?

A. $f(x) = -\sqrt{x} - 2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x} - 2$

10. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3-2x^2}{1-2x^3}$.

A. y = $\frac{5}{2}$ **B.** y = $-\frac{5}{2}$ **C.** y = $\frac{3}{2}$ **D.** y = $-\frac{3}{2}$

11. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

12. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

13. At which value of x the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $x = -2$ **C.** $x = 6$ **D .** $x = -6$

14. Find the critical value of the function $f(x) = x^3 + 6x - 5$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

15. Find the equation of the line that passes through the point $(-2\ , 5)$ and that is parallel to the line $3x + y = -5$.

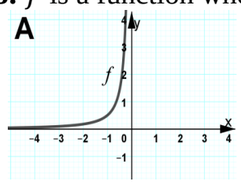
A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

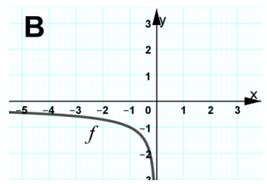
16. The result of $\lim_{x\to 4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

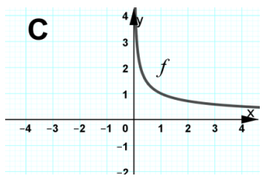
17. Find the value of (b) so that the points $(3\ , -4\ )$, $(2\ , b\ )$ and $(1\ , 2\ )$ are collinear .

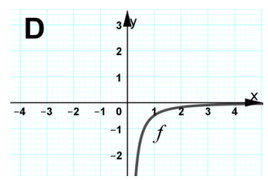
A. -1 **B.** 1 **C.** -2 **D.** 4

18. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

A 

B 

C 

D 

19. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

20. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

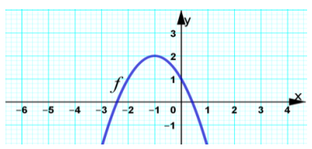
A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

21. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$

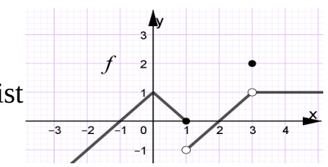


22. Find the equation of the line that passes through the points $(2\ , 0)$ and $(0\ , -3)$

A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

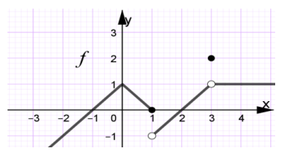
23. Use the given graph on the right to find the result of $\lim_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



24. Use the given graph on the right to find the result of $\lim_{x\to 1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



25. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

26. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x})=3$ **B.** $\frac{d}{dx}(\pi^2-3)=2\pi$ **C.** $\lim_{x\to-\infty}\frac{\sqrt{x^2+x}}{-2x}=\frac{1}{2}$ **D.** $\lim_{x\to1^-}\frac{3}{1-x}=+\infty$

27. The result of $\lim_{x\to3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

28. Which of the following is true ?

A. $\lim_{x\to1^+}\frac{-3}{(x-1)^2}=+\infty$ **B.** $\lim_{x\to0}\frac{\frac{1}{3+x}-\frac{1}{3}}{x}=\frac{1}{9}$ **C.** $\lim_{x\to0}\frac{\sin 3x}{\sin 2x}=\frac{2}{3}$ **D .** $\lim_{x\to0}\frac{1-cosx}{sinx}=0$

29. If $f(x)=\frac{-4}{5-x}$ then the result of $\lim_{\Delta x\to0}\frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

30. The function $f(x)=\begin{cases}x & x<1\\ 2 & x=1\\ 2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim_{x\to1}f(x)$ does not exist .

C. $\lim_{x\to1}f(x)\neq f(1)$ **D.** $\lim_{x\to1}f(x)=f(1)$

31. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A. x^2-3x+4 **B.** x^2+x-8 **C.** x^2+x **D.** $2x-3$

32. The result of $\lim_{x\to-\infty}\frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

33. The y –intercept of the line $y=-3x-4$ is :

A. $(0\,,4)$ **B.** $(0\,,-4)$ **C.** $(0\,,3)$ **D.** $(0\,,-3)$

34. The points of intersection of the functions $f(x)=x^2+2x$ *and* $g(x)=x+2$. is

A. $\begin{cases}(1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3)\\(2\ ,\ 0)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3)\\(-2\ ,\ 0)\end{cases}$ **D.** $\begin{cases}(-1\,,-1)\\(2\ ,\ 4)\end{cases}$

35. If $f(x)=a\,x^3+x$ find the value of $\boldsymbol{a}$ where $f'(2)=13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

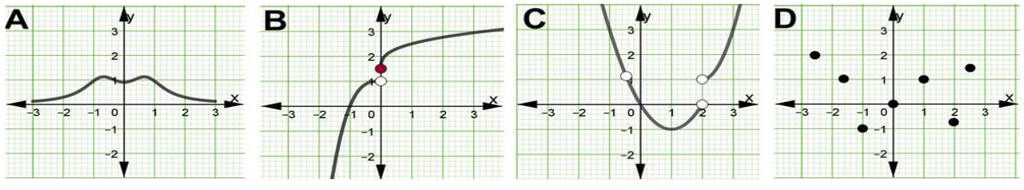
36. If $3-(\frac{1}{4}x-1)^3\leq f(x)\leq 3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim_{x\to4}f(x)$

A. 3 **B.** 2 **C.** 4 **D.** 0

37. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

38. Which of the following graphs represents a one - to - one function?



39. In which interval is the function $f(x)=e^{\,x^3-6\,x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.** $]-\infty\,,0\,[\cup\,]4\,,+\infty[$

40. Find the value of $(\boldsymbol{a})$ so that the function $f(x)=\begin{cases}x^3+\frac{1}{2} & x<0\\ 4(x^2+a) & x\geq0\end{cases}$

will be continuous at $x=0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

41. Find the second derivative of the function $f(x)=x\,sinx+cosx$.

A. $f''(x)=-x\,sinx+cosx$ **B.** $f''(x)=x\,cosx+2sinx$

C. $f''(x)=-x\,cosx+sinx$ **D.** $f''(x)=x\,sinx-2cosx$

42. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

43. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

44. Find the domain of the function $f(x)=-\sqrt{x^2-3x-10}$.

A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

45. Which of the following is false ?

A. The distance between the point $(\,\boldsymbol{3}\,,\boldsymbol{-7}\,)$ and the line $\boldsymbol{y=5}$ is $\boldsymbol{12}$.

B. The lines $\boldsymbol{3x+4y=10}$ and $\boldsymbol{4x-3y=14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x)=\frac{-2x}{3x-2}}$ is $\boldsymbol{R-\left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x)=|x+4|}$ is symmetric with respect to the y –axis .

46. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to-\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to+\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$

C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

47. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

48. Find the result of $\lim_{x\to0}\frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

49. Find the derivative of the function $f(x)=\ln x^2$.

A. $f'(x)=\frac{1}{2\,x}$ **B.** $f'(x)=\frac{2}{x}$ **C.** $f'(x)=\frac{1}{x}$ **D.** $f'(x)=2\ln x$

50. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 12 & x=6\end{cases}$

C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ -2 & x=6\end{cases}$

Kurdistan Region – Iraq 0023 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours W 71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000023

Answer the following questions : (two marks for each right choice)

1. The result of $\lim\limits_{x\to-\infty} \frac{3x}{4\,cosx-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

2. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

3. Find the value of ($\boldsymbol{b}$) so that the points $(3\,,-4\,)$, $(2\,,\boldsymbol{b}\,)$ and $(1\,,2\,)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

4. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between $-\mathbf{2}$ and $\mathbf{0}$.

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

5. Find the result of $\lim\limits_{x\to1} \frac{\sqrt{x}-1}{1-x}$: **A.** $-\mathbf{1}$ **B.** $\mathbf{1}$ **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

6. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

7. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

8. Find the critical value of the function $\boldsymbol{f(x) = x^3 + 6x - 5}$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

9. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

10. Which of the following is true ?

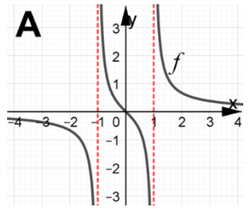
A. $\lim\limits_{x\to1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim\limits_{x\to0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim\limits_{x\to0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D** $\lim\limits_{x\to0} \frac{1-cosx}{sinx} = 0$

11. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

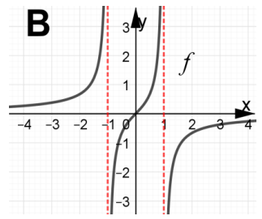
(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

12. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.

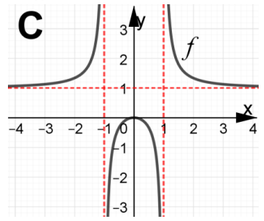
A



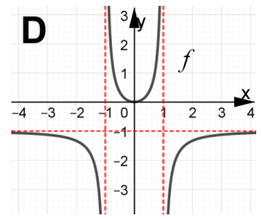
B



C



D



13. If $f(x) = a\,x^3 + x$ find the value of $\boldsymbol{a}$ where $f'(2) = 13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

14. Find the second derivative of the function $f(x) = x\,sinx + cosx$.

A. $f''(x) = -x\,sinx + cosx$ **B.** $f''(x) = x\,cosx + 2sinx$

C. $f''(x) = -x\,cosx + sinx$ **D.** $f''(x) = x\,sinx - 2cosx$

15. The range of which of the following functions is $]-\infty, -2\,]$?

A. $f(x) = -\sqrt{x} - 2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x} - 2$

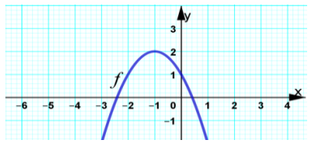
16. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

17. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



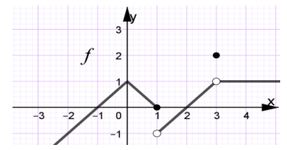
18. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :

A. $y = 3x + 8$ **B.** $y = 3x - 8$ **C.** $y = x + 3$ **D.** $y = x - 3$

19. Find the result of $\lim\limits_{x\to0} \frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

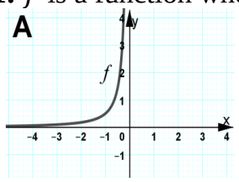
20. Use the given graph on the right to find the result of $\lim\limits_{x\to1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .

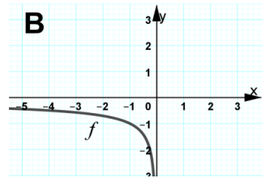


21. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

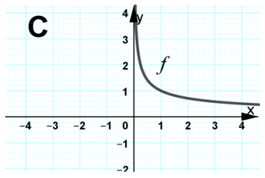
A



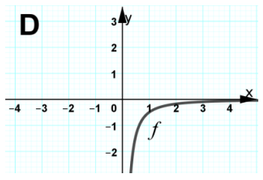
B



C

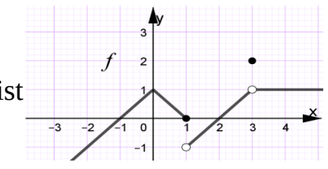


D



22. Use the given graph on the right to find the result of $\lim\limits_{x\to3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



23. The points of intersection of the functions $f(x) = x^2 + 2x$ *and* $g(x) = x + 2$. is

A. $\begin{cases}(1\ ,\ 3\,)\\(2\ ,\ 0\,)\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3\,)\\(2\ ,\ 0\,)\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3\,)\\(-2\ ,\ 0\,)\end{cases}$ **D.** $\begin{cases}(-1\,,-1\,)\\(2\ ,\ 4\,)\end{cases}$

24. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

25. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim_{x\to1^-} \frac{3}{1-x} = +\infty$

26. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2, 5]$ **B.** $]-\infty, -2] \cup [5, +\infty[$ **C.** $[-5, 2]$ **D.** $]-\infty, -5] \cup [2, +\infty[$

27. Redefine the function $f(x) = \frac{x^2-4x-12}{x-6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 4 & x = 6 \end{cases}$ **B.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 12 & x = 6 \end{cases}$

C. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 8 & x = 6 \end{cases}$ **D.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ -2 & x = 6 \end{cases}$

28. The result of $\lim_{x\to3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

29. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ln x$

30. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

A. $y = \frac{-3}{4}x + 8$ **B.** $y = \frac{3}{4}x + 2$ **C.** $y = \frac{3}{4}x - 7$ **D.** $y = \frac{1}{4}x + 4$

31. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

32. The function $f(x) = \begin{cases} x & x < 1 \\ 2 & x = 1 \\ 2x - 1 & x > 1 \end{cases}$ is discontinuous at $x = 1$ because :

A. $f(1)$ is not defined. **B.** $\lim_{x\to1} f(x)$ does not exist .

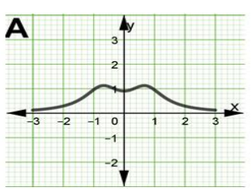
C. $\lim_{x\to1} f(x) \neq f(1)$ **D.** $\lim_{x\to1} f(x) = f(1)$

33. Which of the following function is odd ?

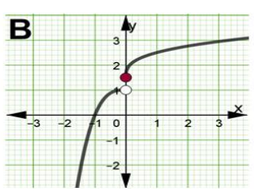
A. $f(x) = 2x\ sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

34. Which of the following graphs represents a one - to - one function?

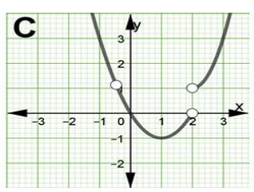
A



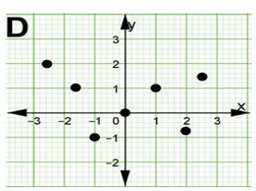
B



C



D



35. Find the equation of the line that passes through the points $(2, 0)$ and $(0, -3)$

A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

36. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3-2x^2}{1-2x^3}$.

A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

37. The result of $\lim_{x\to4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

38. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

39. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x) = x^3 - 2x^2 + 1$ **B.** $f(x) = x^2 - 2x^3 + 1$

C. $f(x) = x^4 - 2x^3 + 1$ **D.** $f(x) = x^3 - 2x^4 + 1$

40. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

41. Find the value of $(\boldsymbol{a})$ so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \geq 0 \end{cases}$

will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

42. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

43. Find the equation of the line that passes through the point $(-2, 5)$ and that is parallel to the line $3x + y = -5$.

A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

44. The y –intercept of the line $y = -3x - 4$ is :

A. $(0, 4)$ **B.** $(0, -4)$ **C.** $(0, 3)$ **D.** $(0, -3)$

45. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $\boldsymbol{x = -2}$ **C.** $x = 6$ **D .** $x = -6$

46. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim_{\Delta x\to0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

47. In which interval is the function $f(x) = e^{x^3-6x^2+8}$ increasing ?

A. $]-\infty, 4[$ **B.** $]2, 4[$ **C.** $]0, 4[$ **D.** $]-\infty, 0[\cup]4, +\infty[$

48. The result of $\lim_{x\to2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

49. If $3 - (\frac{1}{4}x - 1)^3 \leq f(x) \leq 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim_{x\to4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

50. Which of the following is false ?

A. The distance between the point $(\boldsymbol{3, -7})$ and the line $\boldsymbol{y = 5}$ is $\boldsymbol{12}$.

B. The lines $\boldsymbol{3x + 4y = 10}$ and $\boldsymbol{4x - 3y = 14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x) = \frac{-2x}{3x-2}}$ is $\boldsymbol{R - \{\frac{2}{3}\}}$.

D. The graph of the function $\boldsymbol{f(x) = |x + 4|}$ is symmetric with respect to the y –axis .

Kurdistan Region – Iraq 0024 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours

71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000024

Answer the following questions : (two marks for each right choice)

1. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

2. Find the equation of the line that passes through the points $(2,0)$ and $(0,-3)$

A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

3. The function $f(x) = \begin{cases} x & x < 1 \\ 2 & x = 1 \\ 2x - 1 & x > 1 \end{cases}$ is discontinuous at $x = 1$ because :

A. $f(1)$ is not defined. **B.** $\lim_{x\to 1} f(x)$ does not exist .

C. $\lim_{x\to 1} f(x) \neq f(1)$ **D.** $\lim_{x\to 1} f(x) = f(1)$

4. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

5. If $f(x) = a\,x^3 + x$ find the value of a where $f'(2) = 13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

6. The result of $\lim_{x\to-\infty} \frac{3x}{4\cos x - 2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

7. Find the result of $\lim_{x\to 1} \frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

8. Find the second derivative of the function $f(x) = x\sin x + \cos x$.

A. $f''(x) = -x\sin x + \cos x$ **B.** $f''(x) = x\cos x + 2\sin x$

C. $f''(x) = -x\cos x + \sin x$ **D.** $f''(x) = x\sin x - 2\cos x$

9. Find the value of (a) so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \geq 0 \end{cases}$

will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D.** $\frac{1}{8}$

10. In which interval is the function $f(x) = e^{x^3 - 6x^2 + 8}$ increasing ?

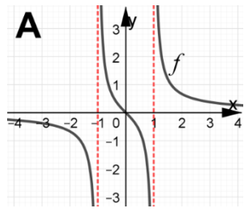
A. $]-\infty, 4[$ **B.** $]2, 4[$ **C.** $]0, 4[$ **D.** $]-\infty, 0[\cup]4, +\infty[$

11. If $3 - (\frac{1}{4}x - 1)^3 \leq f(x) \leq 3 + (\frac{1}{4}x - 1)^3$, use the squeeze theorem to find the value of $\lim_{x\to 4} f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

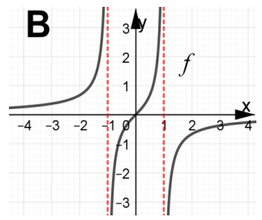
12. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , t is measured in seconds and S in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

13. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.

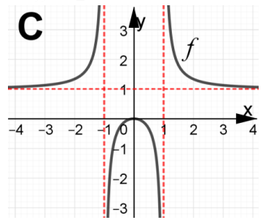
A



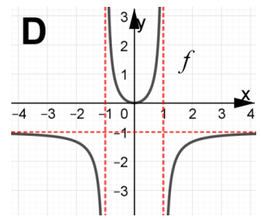
B



C



D



14. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

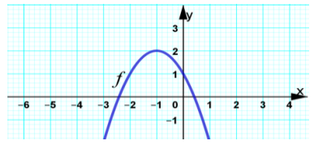
15. Find the equation of the line that passes through the point $(-2, 5)$ and that is parallel to the line $3x + y = -5$.

A. $y = 3x + 11$ **B.** $y = -3x - 1$ **C.** $y = 3x - 11$ **D.** $y = -3x + 1$

16. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



17. Which of the following is false ?

A. The distance between the point $(3, -7)$ and the line $y = 5$ is **12** .

B. The lines $3x + 4y = 10$ and $4x - 3y = 14$ are perpendicular .

C. The domain of the function $f(x) = \frac{-2x}{3x-2}$ is $R - \{\frac{2}{3}\}$.

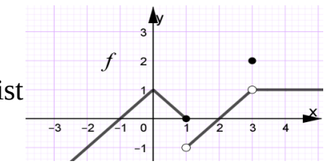
D. The graph of the function $f(x) = |x + 4|$ is symmetric with respect to the y −axis .

18. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3 - 2x^2}{1 - 2x^3}$.

A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

19. Use the given graph on the right to find the result of $\lim_{x\to 3} f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



20. The result of $\lim_{x\to 2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

21. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

22. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

23. Find all the vertical asymptotes to the function $f(x) = \frac{-1}{\cos(\pi x)}$.

(**A.** $x = \frac{1}{2} + n$ **B.** $x = \frac{\pi}{2} + n\pi$ **C.** $x = n\pi$ **D.** $x = n$) $n \in I$

24. Find the critical value of the function $f(x) = x^3 + 6x - 5$

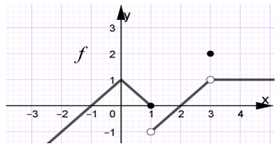
A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

25. Which of the following function is odd ?

A. $f(x) = 2x\ sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

26. Use the given graph on the right to find the result of $\lim_{x\to 1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



27. The result of $\lim_{x\to 3} \frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

28. The equation of the slant asymptote to the graph of the function $f(x) = \frac{3x^2+2x-1}{x-2}$ is :

A. $y = 3x + 8$ **B.** $y = 3x - 8$ **C.** $y = x + 3$ **D.** $y = x - 3$

29. Find the value of (b) so that the points $(3\ ,-4\ )$, $(2\ ,b\ )$ and $(1\ ,2\ )$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

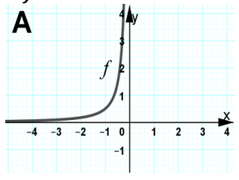
30. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

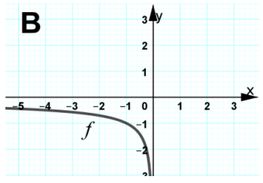
C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

31. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

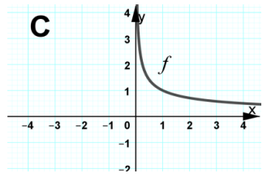
A



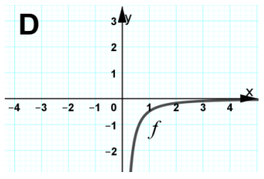
B



C



D



32. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim_{x\to 1^-} \frac{3}{1-x} = +\infty$

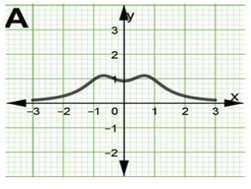
33. Which of the following is true ?

A. $\lim_{x\to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim_{x\to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim_{x\to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D** .$\lim_{x\to 0} \frac{1-cosx}{sinx} = 0$

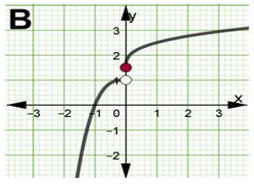
34. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim_{\Delta x\to 0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

35. Which of the following graphs represents a one - to - one function?

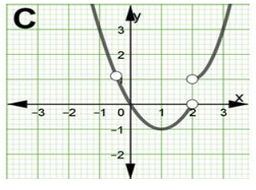
A



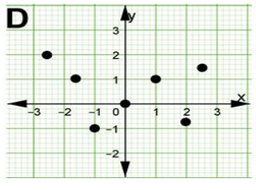
B



C



D



36. The range of which of the following functions is $]-\infty,-2\ ]$?

A. $f(x) = -\sqrt{x} - 2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x} - 2$

37. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between -2 and 0 .

A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

38. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

A. $(0\ ,0)$ **B.** $(1\ ,2)$ **C.** $(0\ ,2)$ **D.** $(-1\ ,2)$

39. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2\ ,5\ ]$ **B.** $]-\infty,-2\ ] \cup [5\ ,+\infty[$ **C.** $[-5\ ,2\ ]$ **D.** $]-\infty,-5\ ] \cup [2\ ,+\infty[$

40. The y –intercept of the line $y = -3x - 4$ is :

A. $(0\ ,4\ )$ **B.** $(0\ ,-4\ )$ **C.** $(0\ ,3\ )$ **D.** $(0\ ,-3\ )$

41. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 m^2 B. 850 m^2 C. 784 m^2 D. 824 m^2

42. Redefine the function $f(x) = \frac{x^2-4x-12}{x-6}$ to be continuous at $x = 6$

A. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 4 & x = 6 \end{cases}$ **B.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 12 & x = 6 \end{cases}$

C. $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ 8 & x = 6 \end{cases}$ **D.** $h(x) = \begin{cases} \frac{x^2-4x-12}{x-6} & x \neq 6 \\ -2 & x = 6 \end{cases}$

43. Find the result of $\lim_{x\to 0} \frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

44. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ \ln x$

45. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

A. $y = \frac{-3}{4}x + 8$ **B.** $y = \frac{3}{4}x + 2$ **C.** $y = \frac{3}{4}x - 7$ **D.** $y = \frac{1}{4}x + 4$

46. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x) = x^3 - 2x^2 + 1$ **B.** $f(x) = x^2 - 2x^3 + 1$

C. $f(x) = x^4 - 2x^3 + 1$ **D.** $f(x) = x^3 - 2x^4 + 1$

47. The points of intersection of the functions $f(x) = x^2 + 2x\ and\ g(x) = x + 2$. is

A. $\begin{cases} (1\ ,\ 3\ ) \\ (2\ ,\ 0\ ) \end{cases}$ **B.** $\begin{cases} (-1\ ,\ 3\ ) \\ (2\ ,\ 0\ ) \end{cases}$ **C.** $\begin{cases} (1\ ,\ 3\ ) \\ (-2\ ,\ 0\ ) \end{cases}$ **D.** $\begin{cases} (-1\ ,-1\ ) \\ (2\ ,\ 4\ ) \end{cases}$

48. The result of $\lim_{x\to 4} \frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

49. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

50. At which value of x the tangent line to the graph of the function $f(x) = -2(x+2)^3$ is horizontal . **A.** $x = 2$ **B.** $x = -2$ **C.** $x = 6$ **D** . $x = -6$

Kurdistan Region – Iraq 0025 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours Y

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

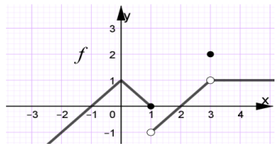
71027

SN: 400000025

Answer the following questions : (two marks for each right choice)

1. Use the given graph on the right to find the result of $\lim_{x\to 1^-} f(x)$

A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



2. If $(fog)(x) = -4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

A. $f(x) = x^2 - 1$, $g(x) = 2x - 1$ **B.** $f(x) = 1 - x^2$, $g(x) = 2x + 1$

C. $f(x) = 1 - x$, $g(x) = 2x^2 + 1$ **D.** $f(x) = 2x + 1$, $g(x) = x^2 - 1$

3. Find the critical value of the function $\boldsymbol{f(x) = x^3 + 6x - 5}$

A. $x = -1$ **B.** $x = 1$ **C.** $x = 2$ **D.** $None$

4. Find the second derivative of the function $f(x) = x\,sinx + cosx$.

A. $f''(x) = -x\,sinx + cosx$ **B.** $f''(x) = x\,cosx + 2sinx$

C. $f''(x) = -x\,cosx + sinx$ **D.** $f''(x) = x\,sinx - 2cosx$

5. The result of $\lim_{x\to 2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

6. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim_{x\to 1^-} \frac{3}{1-x} = +\infty$

7. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

8. Find the point of inflection for the function $f(x) = x^3 - x + 2$.

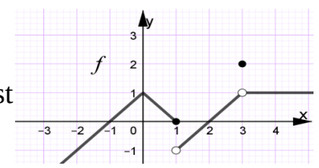
A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

9. Find the value of $(\boldsymbol{a})$ so that the function $f(x) = \begin{cases} x^3 + \frac{1}{2} & x < 0 \\ 4(x^2 + a) & x \geq 0 \end{cases}$

will be continuous at $x = 0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

10. Use the given graph on the right to find the result of $\lim_{x\to 3} f(x)$

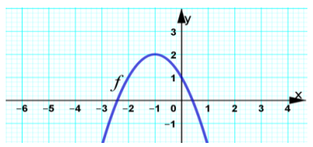
A. 1 **B.** 0 **C.** 2 **D.** Does not exist



11. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



12. If $f(x) = a\,x^3 + x$ find the value of $\boldsymbol{a}$ where $f'(2) = 13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

13. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

14. If $f(x) = x^2 - 3x + 4$ find the result of $f(x+2) - f(2)$.

A. $x^2 - 3x + 4$ **B.** $x^2 + x - 8$ **C.** $x^2 + x$ **D.** $2x - 3$

15. The function $f(x) = \begin{cases} x & x < 1 \\ 2 & x = 1 \\ 2x - 1 & x > 1 \end{cases}$ is discontinuous at $x = 1$ because :

A. $f(1)$ is not defined. **B.** $\lim_{x\to 1} f(x)$ does not exist .

C. $\lim_{x\to 1} f(x) \neq f(1)$ **D.** $\lim_{x\to 1} f(x) = f(1)$

16. Which of the following is true ?

A. $\lim_{x\to 1^+} \frac{-3}{(x-1)^2} = +\infty$ **B.** $\lim_{x\to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} = \frac{1}{9}$ **C.** $\lim_{x\to 0} \frac{\sin 3x}{\sin 2x} = \frac{2}{3}$ **D .** $\lim_{x\to 0} \frac{1-cosx}{sinx} = 0$

17. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

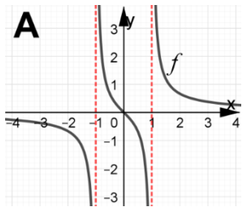
A. $2x - y - 3 = 0$ **B.** $3x - 2y - 6 = 0$ **C.** $\frac{x}{3} - \frac{y}{2} = 1$ **D.** $\frac{x}{2} + \frac{y}{3} = 1$

18. The points of intersection of the functions $f(x) = x^2 + 2x$ *and* $g(x) = x + 2$. is

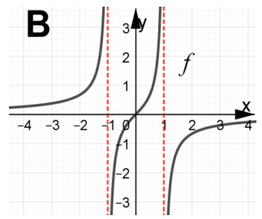
A. $\begin{cases}(1\ ,\ 3\ ) \\ (2\ ,\ 0\ )\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3\ ) \\ (2\ ,\ 0\ )\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3\ ) \\ (-2\ ,\ 0\ )\end{cases}$ **D.** $\begin{cases}(-1\ ,-1\ ) \\ (2\ ,\ 4\ )\end{cases}$

19. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.

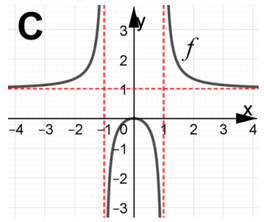
A



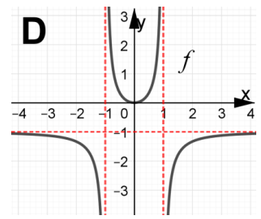
B



C



D



20. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

21. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

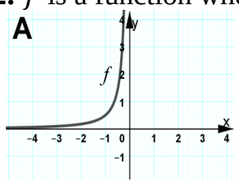
x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

22. f is a function whose derivative is an increasing function, find a graph of f where $f' < 0$

A



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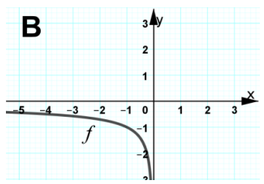
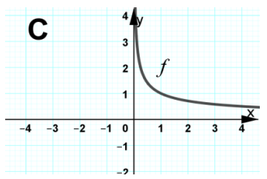
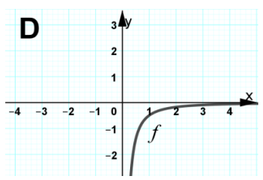


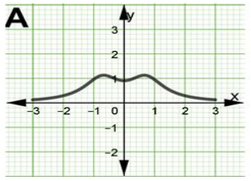
C

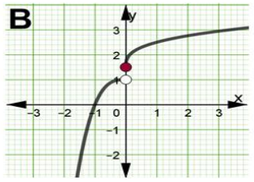


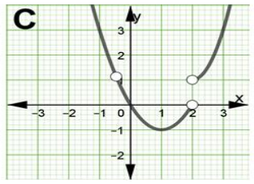
D

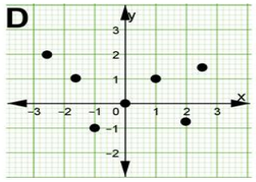


23. Which of the following graphs represents a one - to - one function?

A 

B 

C 

D 

24. Find the horizontal asymptote to the graph of a function $f(x)=\frac{5x^3-2x^2}{1-2x^3}$.

A. $y=\frac{5}{2}$ **B.** $y=-\frac{5}{2}$ **C.** $y=\frac{3}{2}$ **D.** $y=-\frac{3}{2}$

25. Find the equation of the tangent line to the graph of the function $f(x)=x+\frac{4}{x}$ at $x=4$.

A. $y=\frac{-3}{4}x+8$ **B.** $y=\frac{3}{4}x+2$ **C.** $y=\frac{3}{4}x-7$ **D.** $y=\frac{1}{4}x+4$

26. Find the domain of the function $f(x)=-\sqrt{x^2-3x-10}$.

A. $[-2\,,5\,]$ **B.** $]-\infty,-2\,]\cup[5\,,+\infty[$ **C.** $[-5\,,2\,]$ **D.** $]-\infty,-5\,]\cup[2\,,+\infty[$

27. A point moves on the x-axis , the function $S(t)=12t-t^3$ is the position function of this point , $\boldsymbol{t}$ is measured in seconds and $\boldsymbol{S}$ in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

28. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.** $\boldsymbol{x=-2}$ **C.** $x=6$ **D .** $x=-6$

29. Which of the following is false ?

A. The distance between the point $(\,\boldsymbol{3}\,,\boldsymbol{-7}\,)$ and the line $\boldsymbol{y=5}$ is $\boldsymbol{12}$.

B. The lines $\boldsymbol{3x+4y=10}$ and $\boldsymbol{4x-3y=14}$ are perpendicular .

C. The domain of the function $\boldsymbol{f(x)=\frac{-2x}{3x-2}}$ is $\boldsymbol{R-\left\{\frac{2}{3}\right\}}$.

D. The graph of the function $\boldsymbol{f(x)=|x+4|}$ is symmetric with respect to the y −axis .

30. Find the result of $\lim\limits_{x\to1}\frac{\sqrt{x}-1}{1-x}$: **A.** $\boldsymbol{-1}$ **B.** $\boldsymbol{1}$ **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

31. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

32. The result of $\lim\limits_{x\to3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

33. Find the derivative of the function $f(x)=\ln x^2$.

A. $f'(x)=\frac{1}{2x}$ **B.** $f'(x)=\frac{2}{x}$ **C.** $f'(x)=\frac{1}{x}$ **D.** $f'(x)=2\ln x$

34. Find the slope of the tangent line to the curve $y^4=y^2-x^2$ at the point $\left(\frac{\sqrt{3}}{4},\frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

35. The result of $\lim\limits_{x\to-\infty}\frac{3x}{4\cos x-2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

36. Find the value of ($\boldsymbol{b}$) so that the points $(3\,,-4\,)$, $(2\,,\boldsymbol{b}\,)$ and $(1\,,2\,)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

37. Find the result of $\lim\limits_{x\to0}\frac{e^x-1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

38. Which of the following functions achieves the behavior:

$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to-\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to+\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$

C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

39. In which interval is the function $f(x)=e^{\,x^3-6x^2+8}$ increasing ?

A. $]-\infty\,,4\,[$ **B.** $]2\,,4[$ **C.** $]0\,,4[$ **D.** $]-\infty\,,0\,[\cup]4\,,+\infty[$

40. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 12 & x=6\end{cases}$

C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ -2 & x=6\end{cases}$

41. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$

42. Find the equation of the line that passes through the point $(-2\,,5)$ and that is parallel to the line $3x+y=-5$.

A. $y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

43. The range of which of the following functions is $]-\infty,-2\,]$?

A. $f(x)=-\sqrt{x}-2$ **B.** $f(x)=\sqrt{x+2}$ **C.** $f(x)=-\sqrt{x+2}$ **D.** $f(x)=\sqrt{x}-2$

44. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

45. The result of $\lim\limits_{x\to4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

46. Which of the following function is odd ?

A. $f(x)=2x\,sinx$ **B.** $f(x)=\frac{3}{x^2}$ **C.** $f(x)=\frac{x}{|x|}$ **D.** $f(x)=x+cosx$

47. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x)=0$ has a root between $\boldsymbol{-2}$ and $\boldsymbol{0}$.

A. $f(x)=\frac{x-1}{x+1}$ **B.** $f(x)=x^2-3x+2$

C. $f(x)=2x^2+3x-3$ **D.** $f(x)=2x^3-2x+1$

48. The y –intercept of the line $y=-3x-4$ is :

A. $(0\,,4\,)$ **B.** $(0\,,-4\,)$ **C.** $(0\,,3\,)$ **D.** $(0\,,-3\,)$

49. If $f(x)=\frac{-4}{5-x}$ then the result of $\lim\limits_{\Delta x\to0}\frac{f(2+\Delta x)-f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

50. If $3-(\frac{1}{4}x-1)^3\le f(x)\le3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to4}f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

Kurdistan Region – Iraq 0026 In the Name of Allah Name: _____

High Committee for General Examinations Subject: Maths Time: 3:30 Hours

71027

General exams for preparatory stage For the Academic year (2020-2021) Second attempt

SN: 400000026

Answer the following questions : (two marks for each right choice)

1. The result of $\lim_{x\to 2} \frac{\sqrt{6-x}-2}{x-2}$ is : **A.** $\frac{-1}{4}$ **B.** -4 **C.** $\frac{1}{4}$ **D.** 4

2. Which of the following function is odd ?

A. $f(x) = 2x\ sinx$ **B.** $f(x) = \frac{3}{x^2}$ **C.** $f(x) = \frac{x}{|x|}$ **D.** $f(x) = x + cosx$

3. In which interval is the function $f(x) = e^{x^3-6x^2+8}$ increasing ?

A. $]-\infty, 4[$ **B.** $]2, 4[$ **C.** $]0, 4[$ **D.** $]-\infty, 0[\cup]4, +\infty[$

4. Find the rate of change of the distance between a particle moving on the parabola $y = x^2 + 1$, and the origin at $x = 1$, knowing that $\frac{dx}{dt} = 2\ cm/s$.

A. $10\sqrt{5}$ **B.** $5\sqrt{5}$ **C.** $2\sqrt{5}$ **D.** $\sqrt{5}$

5. Which of the following is false ?

A. $\frac{d}{dx}(\ln e^{3x}) = 3$ **B.** $\frac{d}{dx}(\pi^2 - 3) = 2\pi$ **C.** $\lim_{x\to-\infty} \frac{\sqrt{x^2+x}}{-2x} = \frac{1}{2}$ **D.** $\lim_{x\to 1^-} \frac{3}{1-x} = +\infty$

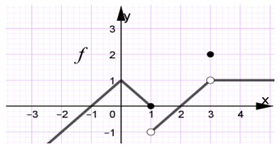
6. A point moves on the x-axis , the function $S(t) = 12t - t^3$ is the position function of this point , t is measured in seconds and S in meters . Find the average velocity of this point during the first three seconds . (**A.** -5 **B.** 5 **C.** -3 **D.** 3) (m/sec)

7. If $f(x) = a\,x^3 + x$ find the value of a where $f'(2) = 13$.

A. 2 **B.** -2 **C.** -1 **D.** 1

8. Use the given graph on the right to find the result of $\lim_{x\to 1^-} f(x)$

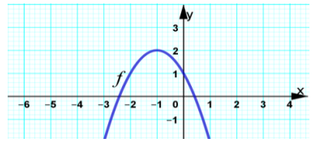
A. 0 **B.** -1 **C.** 1 **D.** Does not exist .



9. Which one is the function of the given graph?

A. $f(x) = -(x+1)^2 - 2$ **B.** $f(x) = -(x+1)^2 + 2$

C. $f(x) = -(x-1)^2 + 2$ **D.** $f(x) = -(x-1)^2 - 2$



10. Determine the table of the function $f(x) = C\sqrt{|x|}$

A

x	-4	-1	0	1	4
y	-8	-32	0	32	8

B

x	-4	-1	0	1	4
y	-1	5	0	5	1

C

x	-4	-1	0	1	4
y	-32	-2	0	-2	-32

D

x	-4	-1	0	1	4
y	6	3	0	3	6

11. Find the result of $\lim_{x\to 0} \frac{e^x - 1}{\sin(\pi x)}$ (Use L'Hopital's rule) **A.** π **B.** $-\pi$ **C.** $\frac{1}{\pi}$ **D.** $\frac{-1}{\pi}$

12. The range of which of the following functions is $]-\infty, -2]$?

A. $f(x) = -\sqrt{x} - 2$ **B.** $f(x) = \sqrt{x+2}$ **C.** $f(x) = -\sqrt{x+2}$ **D.** $f(x) = \sqrt{x} - 2$

13. Find the domain of the function $f(x) = -\sqrt{x^2 - 3x - 10}$.

A. $[-2, 5]$ **B.** $]-\infty, -2] \cup [5, +\infty[$ **C.** $[-5, 2]$ **D.** $]-\infty, -5] \cup [2, +\infty[$

14. Find the equation of the tangent line to the graph of the function $f(x) = x + \frac{4}{x}$ at $x = 4$.

A. $y = \frac{-3}{4}x + 8$ **B.** $y = \frac{3}{4}x + 2$ **C.** $y = \frac{3}{4}x - 7$ **D.** $y = \frac{1}{4}x + 4$

15. Find the derivative of the function $f(x) = \ln x^2$.

A. $f'(x) = \frac{1}{2x}$ **B.** $f'(x) = \frac{2}{x}$ **C.** $f'(x) = \frac{1}{x}$ **D.** $f'(x) = 2\ln x$

16. Find the horizontal asymptote to the graph of a function $f(x) = \frac{5x^3 - 2x^2}{1 - 2x^3}$.

A. $y = \frac{5}{2}$ **B.** $y = -\frac{5}{2}$ **C.** $y = \frac{3}{2}$ **D.** $y = -\frac{3}{2}$

17. The y –intercept of the line $y = -3x - 4$ is :

A. $(0, 4)$ **B.** $(0, -4)$ **C.** $(0, 3)$ **D.** $(0, -3)$

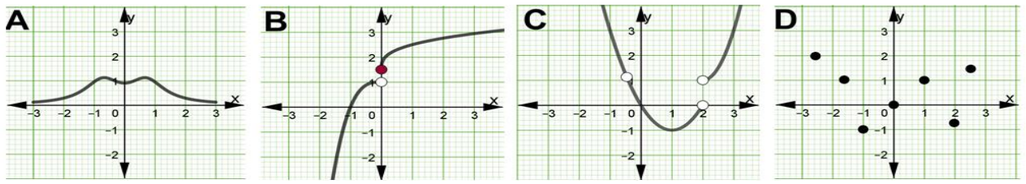
18. Find the derivative of the function $f(x) = \frac{x}{\sqrt{x^4+1}}$.

A. $f'(x) = \frac{1-x^4}{(x^4+1)\sqrt{x^4+1}}$ **B.** $f'(x) = \frac{x^4-1}{(x^4+1)\sqrt{x^4+1}}$

C. $f'(x) = \frac{2x^4-1}{(x^4+1)\sqrt{x^4+1}}$ **D.** $f'(x) = \frac{x^4-2x}{(x^4+1)\sqrt{x^4+1}}$

19. The result of $\lim_{x\to-\infty} \frac{3x}{4\,cosx - 2x}$ is : **A.** $-\infty$ **B.** 0 **C.** $\frac{3}{4}$ **D.** $\frac{-3}{2}$

20. Which of the following graphs represents a one - to - one function?



21. If $f(x) = \frac{-4}{5-x}$ then the result of $\lim_{\Delta x\to 0} \frac{f(2+\Delta x) - f(2)}{\Delta x}$ is : **A.** $\frac{4}{3}$ **B.** $\frac{-4}{3}$ **C.** $\frac{4}{9}$ **D.** $\frac{-4}{9}$

22. The population of a city was (3 687 000) in the year 2003 and (4 042 000) in the year 2013 What was the average rate of the population?

A. 45 500 **B.** 35 500 **C.** 25 500 **D.** 15 500

23. Depending on the intermediate value theorem (IVT) , at which function the equation $f(x) = 0$ has a root between -2 and 0 .

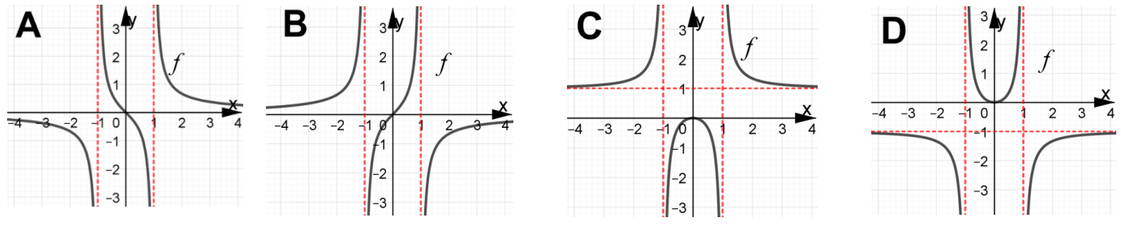
A. $f(x) = \frac{x-1}{x+1}$ **B.** $f(x) = x^2 - 3x + 2$

C. $f(x) = 2x^2 + 3x - 3$ **D.** $f(x) = 2x^3 - 2x + 1$

24. Find the slope of the tangent line to the curve $y^4 = y^2 - x^2$ at the point $\left(\frac{\sqrt{3}}{4}, \frac{1}{2}\right)$.

A. $\sqrt{3}$ **B.** $-\sqrt{3}$ **C.** 1 **D.** -1

25. Use the intercepts, symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x}{x^2-1}$.



26. Which of the following functions achieves the behavior:
$f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ -\infty$, $f(x)\ tends\ to\ +\infty\ as\ x\ tends\ to\ +\infty$

A. $f(x)=x^3-2x^2+1$ **B.** $f(x)=x^2-2x^3+1$
C. $f(x)=x^4-2x^3+1$ **D.** $f(x)=x^3-2x^4+1$

27. Find the second derivative of the function $f(x)=x\,sinx+cosx$.

A. $f''(x)=-x\,sinx+cosx$ **B.** $f''(x)=x\,cosx+2sinx$
C. $f''(x)=-x\,cosx+sinx$ **D.** $f''(x)=x\,sinx-2cosx$

28. The result of $\lim\limits_{x\to4}\frac{x^2-5x+4}{x^2-2x-8}$ is . **A.** $\frac{-1}{2}$ **B.** $\frac{1}{2}$ **C.** 0 **D.** 2

29. Find all the vertical asymptotes to the function $f(x)=\frac{-1}{\cos(\pi x)}$.

(**A.** $x=\frac{1}{2}+n$ **B.** $x=\frac{\pi}{2}+n\pi$ **C.** $x=n\pi$ **D.** $x=n$) $n\in I$

30. Find the equation of the line that passes through the points $(2\,,0)$ and $(0\,,-3)$

A. $2x-y-3=0$ **B.** $3x-2y-6=0$ **C.** $\frac{x}{3}-\frac{y}{2}=1$ **D.** $\frac{x}{2}+\frac{y}{3}=1$

31. At which value of $\boldsymbol{x}$ the tangent line to the graph of the function $f(x)=-2(x+2)^3$ is horizontal . **A.** $x=2$ **B.** $x=-2$ **C.** $x=6$ **D .** $x=-6$

32. Find the critical value of the function $\boldsymbol{f(x)=x^3+6x-5}$

A. $x=-1$ **B.** $x=1$ **C.** $x=2$ **D.** $None$

33. Which of the following is true ?

A. $\lim\limits_{x\to1^+}\frac{-3}{(x-1)^2}=+\infty$ **B.** $\lim\limits_{x\to0}\frac{\frac{1}{3+x}-\frac{1}{3}}{x}=\frac{1}{9}$ **C.** $\lim\limits_{x\to0}\frac{\sin3x}{\sin2x}=\frac{2}{3}$ **D .** $\lim\limits_{x\to0}\frac{1-cosx}{sinx}=0$

34. Redefine the function $f(x)=\frac{x^2-4x-12}{x-6}$ to be continuous at $x=6$

A. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 4 & x=6\end{cases}$ **B.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 12 & x=6\end{cases}$

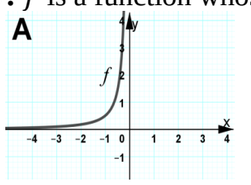
C. $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ 8 & x=6\end{cases}$ **D.** $h(x)=\begin{cases}\frac{x^2-4x-12}{x-6} & x\neq6\\ -2 & x=6\end{cases}$

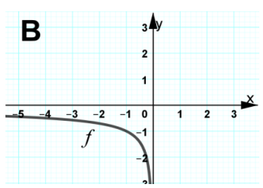
35. The points of intersection of the functions $f(x)=x^2+2x\ and\ g(x)=x+2.$ is

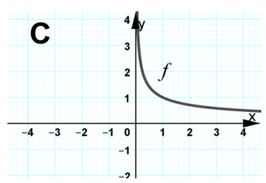
A. $\begin{cases}(1\ ,\ 3\ )\\(2\ ,\ 0\ )\end{cases}$ **B.** $\begin{cases}(-1\ ,\ 3\ )\\(2\ ,\ 0\ )\end{cases}$ **C.** $\begin{cases}(1\ ,\ 3\ )\\(-2\ ,\ 0\ )\end{cases}$ **D.** $\begin{cases}(-1\,,-1\ )\\(\ 2\ ,\ 4\ )\end{cases}$

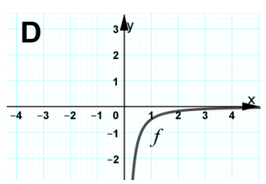
36. If $3-(\frac{1}{4}x-1)^3\le f(x)\le3+(\frac{1}{4}x-1)^3$, use the squeeze theorem to find the value of $\lim\limits_{x\to4}f(x)$ **A.** 3 **B.** 2 **C.** 4 **D.** 0

37. f is a function whose derivative is an increasing function, find a graph of f where $f'<0$

A 

B 

C 

D 

38. If $(fog)(x)=-4x(x+1)$,then find the functions $f(x)$ and $g(x)$.

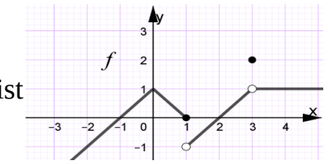
A. $f(x)=x^2-1$, $g(x)=2x-1$ **B.** $f(x)=1-x^2$, $g(x)=2x+1$
C. $f(x)=1-x$, $g(x)=2x^2+1$ **D.** $f(x)=2x+1$, $g(x)=x^2-1$

39. The result of $\lim\limits_{x\to3}\frac{2x^3-54}{3-x}$ is : **A.** 27 **B.** -27 **C.** 54 **D.** -54

40. Find the result of $\lim\limits_{x\to1}\frac{\sqrt{x}-1}{1-x}$: **A.** -1 **B.** 1 **C.** $\frac{-1}{2}$ **D.** $\frac{1}{2}$

41. Use the given graph on the right to find the result of $\lim\limits_{x\to3}f(x)$

A. 1 **B.** 0 **C.** 2 **D.** Does not exist



42. Find the value of ($\boldsymbol{b}$) so that the points $(3\,,-4\,)$, $(2\,,\boldsymbol{b}\,)$ and $(1\,,2\,)$ are collinear .

A. -1 **B.** 1 **C.** -2 **D.** 4

43. Find the equation of the line that passes through the point $(-2\ ,5)$ and that is parallel to the line $3x+y=-5$.

A. $y=3x+11$ **B.** $y=-3x-1$ **C.** $y=3x-11$ **D.** $y=-3x+1$

44. What is the maximum area of a rectangle whose perimeter is (112 m) ?

A. 688 $\boldsymbol{m^2}$ B. 850 $\boldsymbol{m^2}$ C. 784 $\boldsymbol{m^2}$ D. 824 $\boldsymbol{m^2}$

45. The function $f(x)=\begin{cases}x & x<1\\ 2 & x=1\\ 2x-1 & x>1\end{cases}$ is discontinuous at $x=1$ because :

A. $f(1)$ is not defined. **B.** $\lim\limits_{x\to1}f(x)$ does not exist .
C. $\lim\limits_{x\to1}f(x)\neq f(1)$ **D.** $\lim\limits_{x\to1}f(x)=f(1)$

46. Which of the following is false ?

A. The distance between the point ($\boldsymbol{3\,,-7}$) and the line $\boldsymbol{y=5}$ is **12** .
B. The lines $\boldsymbol{3x+4y=10}$ and $\boldsymbol{4x-3y=14}$ are perpendicular .
C. The domain of the function $\boldsymbol{f(x)=\frac{-2x}{3x-2}}$ is $\boldsymbol{R-\left\{\frac{2}{3}\right\}}$.
D. The graph of the function $\boldsymbol{f(x)=|x+4|}$ is symmetric with respect to the $y-$axis .

47. Find the point of inflection for the function $f(x)=x^3-x+2$.

A. $(0\,,0)$ **B.** $(1\,,2)$ **C.** $(0\,,2)$ **D.** $(-1\,,2)$

48. If $f(x)=x^2-3x+4$ find the result of $f(x+2)-f(2)$.

A. x^2-3x+4 **B.** x^2+x-8 **C.** x^2+x **D.** $2x-3$

49. Find the value of $(\boldsymbol{a})$ so that the function $f(x)=\begin{cases}x^3+\frac{1}{2} & x<0\\ 4(x^2+a) & x\ge0\end{cases}$

will be continuous at $x=0$. **A.** $\frac{1}{2}$ **B.** 2 **C.** 8 **D .** $\frac{1}{8}$

50. The equation of the slant asymptote to the graph of the function $f(x)=\frac{3x^2+2x-1}{x-2}$ is :

A. $y=3x+8$ **B.** $y=3x-8$ **C.** $y=x+3$ **D.** $y=x-3$