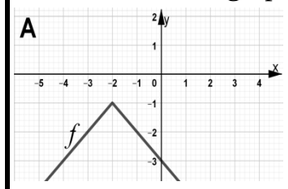
Kurdistan Region – Iraq SN: 30000001 **In the Name of Allah** **Name:** _____

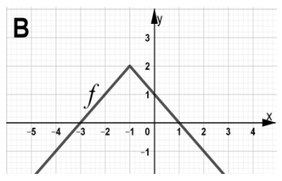
High Committee for General Examinations **Subject: Maths** **Time: 3:30 Hours** **A** 71054

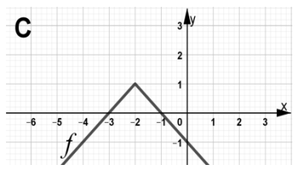
General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp**

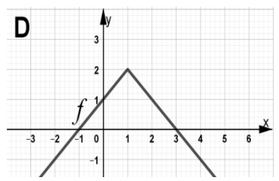
Choose the correct option, two marks for each right answer

1. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.

A 

B 

C 

D 

2. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

3. Find the equation of the line that passes through the point $(-4\,,1\,)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

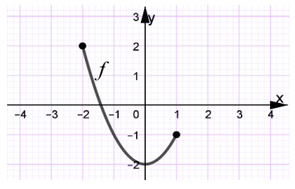
4. Find the value of $\boldsymbol{b}$ when the distance between the point$(\,1\,,-3)$ and the line $3x - \boldsymbol{b}y = 5$ is$(zero)$

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

5. Determine the range of the function f from the given graph on the right .

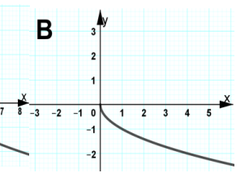
A.$[-2\,,2]$ **B.** $[-2\,,1]$

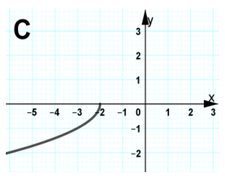
C.$[-1\,,2]$ **D.** $[0\,,2]$

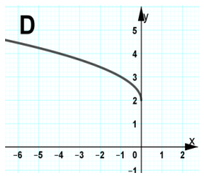


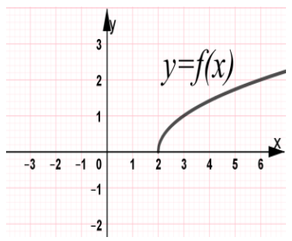
6. Use the given graph of the function $y = f(x)$ on the right , to determine the graph of the function $y = -f(\,x-2\,)$

A 

B 

C 

D 



7. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

8. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

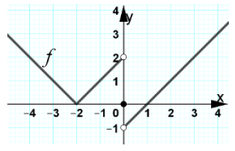
A. $x^2 - 2x$ **B.** $x^2 + 2x$ **C.** $x^2 + 2x + 4$ **D.** $x^2 - 2x + 4$

9. The line $y = -4x + 7$ passes through which of the following points ?

A. $(\,5\,,-3\,)$ **B.** $(-3\,,5\,)$ **C.** $(2\,,-1\,)$ **D .** $(-1\,,2\,)$

10. Use the given graph on the right to find the result of $\lim\limits_{x\to 0^+} f(x)$

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



11. Depending on the intermediate value theorem (IVT). If the function $\boldsymbol{f}$ is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

12. The result of $\lim\limits_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

13. The result of $\lim\limits_{x\to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

14. The result of $\lim\limits_{x\to -2} \frac{\frac{1}{1-x}-\frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

15. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .** $f(x) = \frac{x^2+x-6}{2x^2-8}$

16. Which of the following functions has a removable discontinuity at $x = -3$?

A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

17. Which of the following is true ?

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

18. For what value of $\boldsymbol{a}$, does the function $f(x) = \begin{cases} \boldsymbol{a}x^2 + 1 & x \le 2 \\ 2x - \boldsymbol{a} & x > 2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

19. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

20. If $f(x) = 2\,(sinx\,)\,(\,cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

21. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

22. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(\,2\,,\sqrt{3}\,)$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

23. The result of $\lim\limits_{\Delta x\to 0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

24. Find the value of $\boldsymbol{k}$ such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-\boldsymbol{k}}{\boldsymbol{x}}$. **A.** $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

25. Find the result of $\lim\limits_{x\to+\infty} \frac{ln\,x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

26. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

27. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

28. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

29. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t) = -16t^2 + 192\,t + 4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

30. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty\,,0\,[$ **B.** $]-\infty\,,4\,[$ **C.** $]\,0\,,+\infty[$ **D.** None

31. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1\,,0\,)$ **B.** $(\,2\,,0\,)$ **C.** $(\,0\,,0\,)$ **D.** None

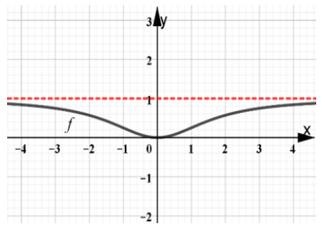
32. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A. $]-1\,,1\,[$ **B.** $]-\infty\,,-1[$ **C.** $]-1\,,+\infty[$ **D.** $None$

33. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

34. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .

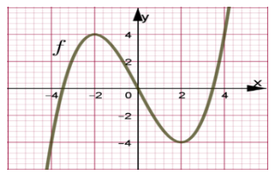


A. $f(x) = \frac{x^2}{x^2+3}$ **B.** $f(x) = \frac{x}{x^2+3}$

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

35. The given graph on the right shows the curve of the function f

On which interval is f' increasing ?

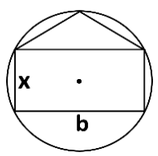


A. $]-\infty\,,0[$ **B.** $]0\,,+\infty[$

C. $]-\infty\,,0[\cup\,]0\,,+\infty[$ **D.** $]-\infty\,,+\infty[$

36. Find the result of $\lim\limits_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

37. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

38. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

39. Find the result of $\lim\limits_{x\to-\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

40. The function $f(x) = \frac{-1}{x+2}$ is always …… in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

41. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

42. The result of $\lim\limits_{x\to-1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

43. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m\,,200\ m$ **B.** $400\ m\,,128\ m$ **C.** $512\ m\,,100\ m$ **D.** $320\ m\,,160\ m$

44. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

45. Find the equation of a line passing through the points $(-2\,,-4)$ and $(-2\,,4\,)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

46. Assume that $\boldsymbol{x}$ and $\boldsymbol{y}$ are two differentiable of a variable $\boldsymbol{t}$. If $y = x^3 + 1$.

Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

47. Find the result of $\lim\limits_{x\to0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

48. If f *and* g are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

A. $(f\,g' - f'g\,)' = f'g'' - f''g'$ B. $fg'' + f''g = (\,f\,g\,)''$

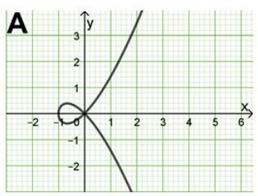
C. $(f'g')' = f''g''$ D. $(\,f\,g\,)'' = f\,g'' + 2f'g' + f''g$

49. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

50. Which of the following graphs represents a function ?

A



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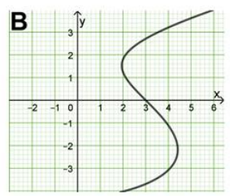

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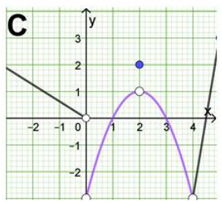

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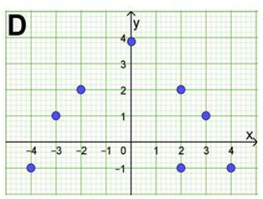


Kurdistan Region – Iraq SN: 30000002 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

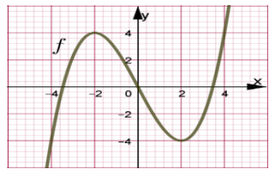
Choose the correct option, two marks for each right answer

1. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

2. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

3. The given graph on the right shows the curve of the function f
On which interval is f' increasing ?



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

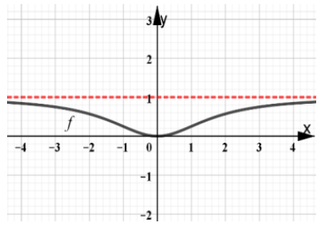
4. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

5. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2, \sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

6. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



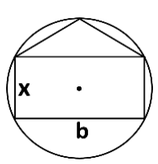
A. $f(x) = \frac{x^2}{x^2+3}$ **B.** $f(x) = \frac{x}{x^2+3}$
C. $f(x) = \frac{x^2}{x^2-3}$ **D.** $f(x) = \frac{x^2-1}{x^2+3}$

7. For what value of a , does the function $f(x) = \begin{cases} ax^2+1 & x \le 2 \\ 2x-a & x > 2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

8. Which of the following is true ?

A. $\lim_{x\to+\infty}(2 + \frac{sinx}{x}) = 2$ **B.** $\lim_{x\to2} \frac{3}{x-2} = 3$ **C.** $\lim_{x\to1} \frac{x^2-1}{x-1} = 0$ **D.** $\lim_{x\to0} \frac{sinx}{x} = 0$

9. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

10. The result of $\lim_{\Delta x\to0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

11. Find the result of $\lim_{x\to0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

12. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

13. Find the value of b when the distance between the point $(1, -3)$ and the line $3x - by = 5$ is $(zero)$

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

14. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A. $]-1, 1[$ **B.** $]-\infty, -1[$ **C.** $]-1, +\infty[$ **D.** $None$

15. Find the equation of the line that passes through the point $(-4, 1)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

16. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

17. The result of $\lim_{x\to0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

18. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

19. The volume of a cube increases an average of $(36\ cm^3/min)$, while its surface area increases $(18\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

20. Find the equation of a line passing through the points $(-2, -4)$ and $(-2, 4)$.

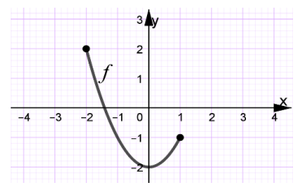
A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

21. Find the result of $\lim_{x\to+\infty} \frac{ln\,x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

22. Assume that x and y are two differentiable of a variable t . If $y = x^3 + 1$.
Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

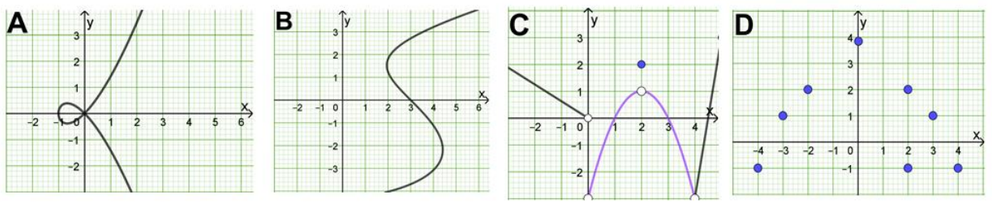
A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

23. Determine the range of the function f from the given graph on the right .



A.$[-2, 2]$ **B.** $[-2, 1]$
C.$[-1, 2]$ **D.** $[0, 2]$

24. Which of the following graphs represents a function ?

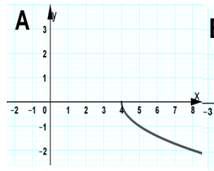
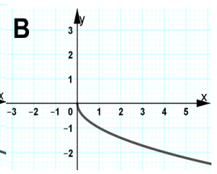
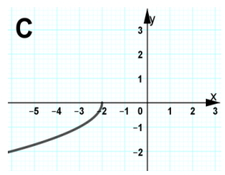
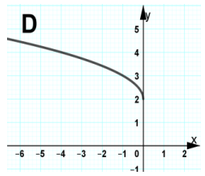
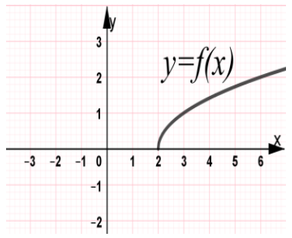


25. Find the result of $\lim_{x\to0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

26. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D .** $(-1, 2)$

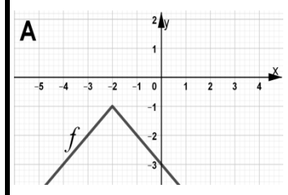
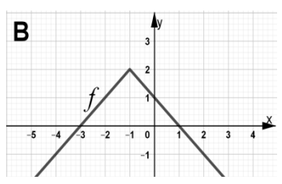
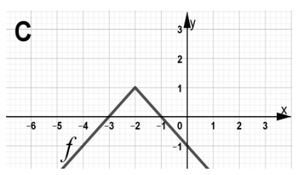
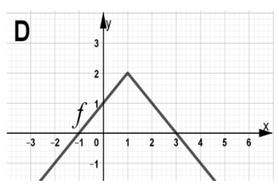
27. Use the given graph of the function $y = f(x)$ on the right ,
to determine the graph of the function $y = -f(x-2)$

A 
B 
C 
D 


28. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

29. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.

A 
B 
C 
D 

30. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

31. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B. If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

32. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

33. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

34. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x - 3x^2 + 1}{2x^2 + 5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

35. Depending on the intermediate value theorem (IVT). If the function $\boldsymbol{f}$ is continuous between $(x = a$ and $x = b)$, then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

36. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

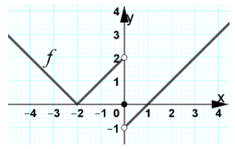
A. 2 **B.** -51 **C.** 51 **D.** -45

37. The result of $\lim_{x \to -1} \frac{x^2 + 2x + 1}{x^2 + 3x + 2}$ is :

A. 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

38. Use the given graph on the right
to find the result of $\lim_{x \to 0^+} f(x)$

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



39. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty, 0[$ **B.** $]-\infty, 4[$ **C.** $]0, +\infty[$ **D.** None

40. The function $f(x) = \frac{-1}{x+2}$ is always ……. in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

41. Find the value of $\boldsymbol{k}$ such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-k}{x}$.

A. $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

42. Find the result of $\lim_{x \to -\infty} \frac{-3x}{\sqrt{x^2+1}}$.

A. -3 **B.** 3 **C.** $+\infty$ **D.** 0

43. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D** .$f(x) = \frac{x^2+x-6}{2x^2-8}$

44. If f *and* g are two differentiable function for all x , and so are their derivatives.
Which of the following is true ?

A. $(fg' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (fg)''$
C. $(f'g')' = f''g''$ D. $(fg)'' = fg'' + 2f'g' + f''g$

45. The result of $\lim_{x \to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

46. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t) = -16t^2 + 192\,t + 4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet
What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

47. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

48. Redefine the function $f(x) = \frac{\sqrt{2-x} - \sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x} - \sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x} - \sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x} - \sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x} - \sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

49. Which of the following functions has a removable discontinuity at $x = -3$?

A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

50. The result of $\lim_{x \to -2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

Kurdistan Region – Iraq SN: 30000003 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

Choose the correct option, two marks for each right answer

1. On which interval is the function $f(x)=\frac{x-1}{x+1}$ convex ?

A. $]-1,1[$ **B.** $]-\infty,-1[$ **C.** $]-1,+\infty[$ **D.** *None*

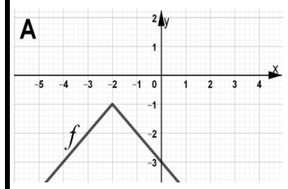
2. Find the result of $\lim\limits_{x\to-\infty}\frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

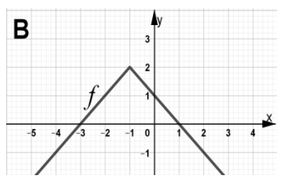
3. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

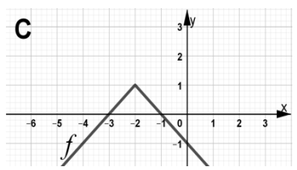
A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

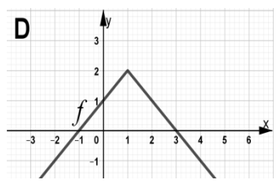
4. Find the result of $\lim\limits_{x\to0}\frac{\frac{5}{2x+10}-\frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

5. Determine the graph of the function $f(x)=2-|x+1|$ by using point plotting.

A 

B 

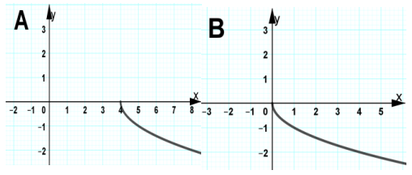
C 

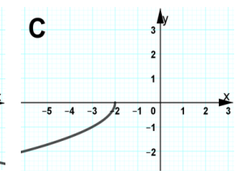
D 

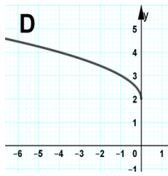
6. Determine the equation of the horizontal asymptote of the function $f(x)=\frac{2x-3x^2+1}{2x^2+5x}$.

A. $y=1$ **B.** $y=\frac{-3}{2}$ **C.** $y=\frac{-3}{5}$ **D.** $y=0$

7. Use the given graph of the function $y=f(x)$ on the right , to determine the graph of the function $y=-f(x-2)$

A 

B 

C 

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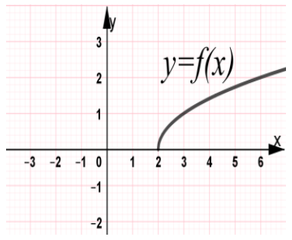
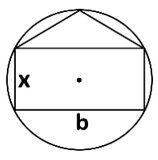


8. The result of $\lim\limits_{x\to3^-}\frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

9. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

10. Find the equation of the line that passes through the point $(-4,1)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

11. Which of the following functions has no vertical asymptote at $x=2$?

A. $f(x)=\frac{x^2-4}{(x-2)^2}$ **B.** $f(x)=\frac{x+2}{x^2-4}$ **C.** $f(x)=\frac{x^2+4}{x^2-3x+2}$ **D** $.f(x)=\frac{x^2+x-6}{2x^2-8}$

12. Which of the following functions has a vertical asymptote at $x=3$ and slant asymptote at $y=-2x$?

A. $f(x)=\frac{2x}{3-x}$ **B.** $f(x)=\frac{-2x^2+6x+1}{x-3}$ **C.** $f(x)=\frac{-4x^2-18x}{2x-6}$ **D.** $f(x)=\frac{-x^2+12x}{x-3}$

13. Find the derivative of the function $f(x)=x\,e^x$.

A. $f'(x)=e^x$ **B.** $f'(x)=e^x(x+1)$ **C.** $f'(x)=e^x+1$ **D.** $f'(x)=xe^x+1$

14. The result of $\lim\limits_{x\to-2}\frac{\frac{1}{1-x}-\frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

15. The result of $\lim\limits_{x\to-1}\frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

16. If f *and* g are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

A. $(f\,g'-f'g)'=f'g''-f''g'$ B. $fg''+f''g=(f\,g)''$

C. $(f'g')'=f''g''$ D. $(f\,g)''=f\,g''+2f'g'+f''g$

17. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y-x^2+3y=0$ **B.** $y=\sqrt{x-4}$ **C.** $y=|x+2|-2$ **D.** $x^2y-x=0$

18. Find the value of $\boldsymbol{b}$ when the distance between the point $(1,-3)$ and the line $3x-\boldsymbol{b}y=5$ is$(zero)$

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

19. Find the domain of the function $g\circ f$ when $f(x)=4-x^2$ and $g(x)=-\sqrt{x}$.

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

20. The result of $\lim\limits_{\Delta x\to0}\frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

21. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x)=g'(x)$, then $f(x)=g(x)$

C. If $g(x)=-5f(x)$, then $g'(x)=-5f'(x)$

D. If $y=\frac{2x}{\pi}$, then $\frac{dy}{dx}=\frac{2}{\pi}$

22. Which of the following functions has a removable discontinuity at $x=-3$?

A. $f(x)=\frac{x^2-9}{(x+3)^2}$ **B.** $f(x)=\frac{x^3+27}{2x+6}$ **C.** $f(x)=\frac{x^2+9}{x+3}$ **D.** $f(x)=\frac{|x+3|}{2x+6}$

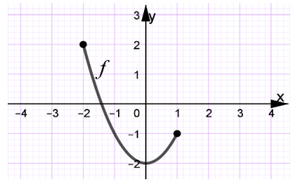
23. The function $f(x)=\frac{-1}{x+2}$ is always ..... in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

24. If $x^2-xy+y^2=1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

25. Determine the range of the function f from the given graph on the right .



A.$[-2,2]$ **B.** $[-2,1]$

C.$[-1,2]$ **D**. $[0,2]$

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26. Depending on the intermediate value theorem (IVT). If the function f is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

27. Assume that x and y are two differentiable of a variable t . If $y = x^3 + 1$.

Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

28. For what value of a , does the function $f(x) = \begin{cases} ax^2 + 1 & x \le 2 \\ 2x - a & x > 2 \end{cases}$ has no points of discontinuity?

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

29. Find the value of k such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-k}{x}$.

A. $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

30. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

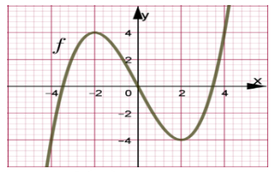
A. $x^2 - 2x$ **B.** $x^2 + 2x$ **C.** $x^2 + 2x + 4$ **D.** $x^2 - 2x + 4$

31. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D .** $(-1, 2)$

32. The given graph on the right shows the curve of the function f

On which interval is f' increasing ?



A. $]-\infty, 0[$ **B.** $]0, +\infty[$

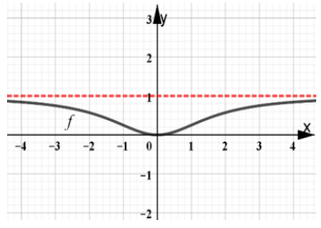
C. $]-\infty, 0[\cup]0, +\infty[$ **D.** $]-\infty, +\infty[$

33. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

34. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

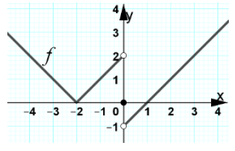
35. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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

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

36. Use the given graph on the right to find the result of $\lim_{x \to 0^+} f(x)$



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

37. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

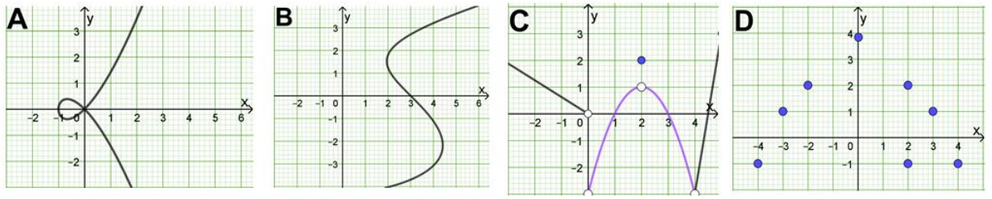
38. Find the equation of a line passing through the points $(-2, -4)$ and $(-2, 4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

39. The volume of a cube increases an average of $(36\ cm^3/min)$, while its surface area increases $(18\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

40. Which of the following graphs represents a function ?



41. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2, \sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

42. In a fireworks festival, a rocket is launched upward .The function $S(t) = -16t^2 + 192\,t + 4$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

43. Which of the following is true ?

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

44. The result of $\lim_{x \to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

45. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty, 0[$ **B.** $]-\infty, 4[$ **C.** $]0, +\infty[$ **D.** None

46. Find the result of $\lim_{x \to +\infty} \frac{ln\, x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

47. Redefine the function $f(x) = \frac{\sqrt{2-x} - \sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x} - \sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x} - \sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x} - \sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x} - \sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

48. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

49. Find the result of $\lim_{x \to 0} \frac{\sqrt{x+5} - \sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

50. Find the third derivative of the function $f(x) = \frac{x^3 - 3x^2 + 4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

Kurdistan Region – Iraq SN: 30000004 **In the Name of Allah** **Name:** _____

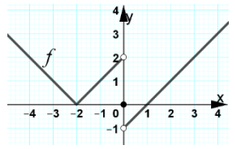
High Committee for General Examinations **Subject: Maths** **Time: 3:30 Hours** **D**

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

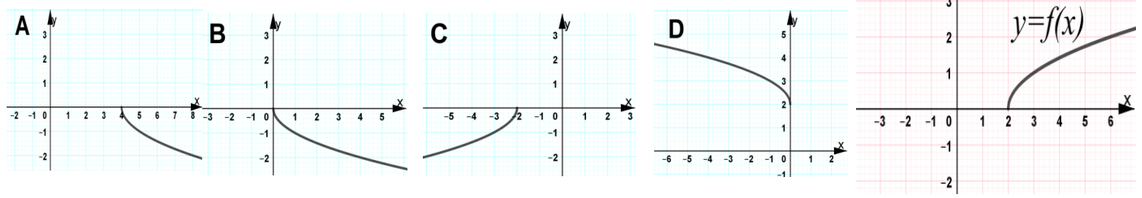
Choose the correct option, two marks for each right answer

1. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$

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



2. Use the given graph of the function $y = f(x)$ on the right , to determine the graph of the function $y = -f(x-2)$



3. The result of $\lim_{x\to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

4. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

5. Find the result of $\lim_{x\to-\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

6. Find the equation of a line passing through the points $(-2,-4)$ and $(-2,4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

7. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

8. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

9. Find the value of $\boldsymbol{b}$ when the distance between the point $(1,-3)$ and the line $3x - by = 5$ is$(zero)$

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

10. Which of the following functions has a removable discontinuity at $x = -3$?

A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

11. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

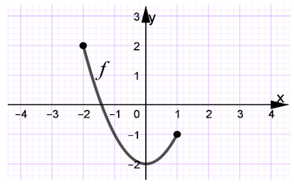
A. 2 cm **B.** 4 cm **C.** $2\sqrt{2}$ cm **D.** 8 cm

12. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .** $f(x) = \frac{x^2+x-6}{2x^2-8}$

13. Determine the range of the function f from the given graph on the right .

A.$[-2,2]$ **B.** $[-2,1]$ **C.**$[-1,2]$ **D.** $[0,2]$



14. Find the value of $\boldsymbol{k}$ such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-k}{x}$. **A.** $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

15. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

16. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

17. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

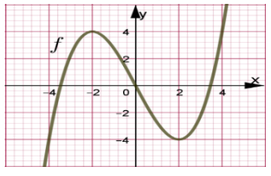
D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

18. For what value of $\boldsymbol{a}$, does the function $f(x) = \begin{cases} \boldsymbol{a}x^2 + 1 & x \leq 2 \\ 2x - \boldsymbol{a} & x > 2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

19. The given graph on the right shows the curve of the function f On which interval is f' increasing ?

A. $]-\infty,0[$ **B.** $]0,+\infty[$

C. $]-\infty,0[\cup]0,+\infty[$ **D.** $]-\infty,+\infty[$



20. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

21. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

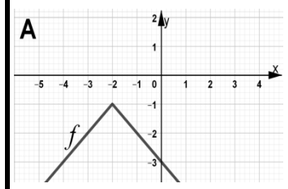
22. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

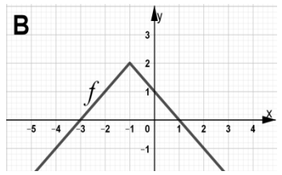
23. Which of the following functions is symmetric with respect to the y - axis ?

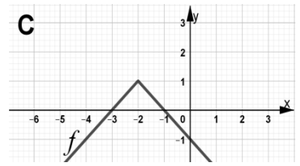
A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

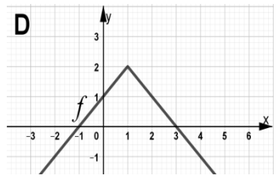
24. Find the result of $\lim_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

25. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.

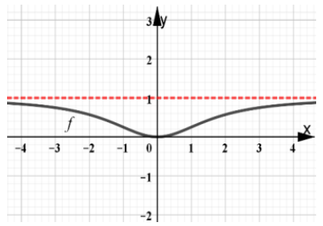
A 

B 

C 

D 

26. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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

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

27. The result of $\lim_{x\to-1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

28. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

29. In a fireworks festival, a rocket is launched upward .The function $S(t) = -16t^2 + 192\,t + 4$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

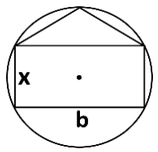
What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

30. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

31. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



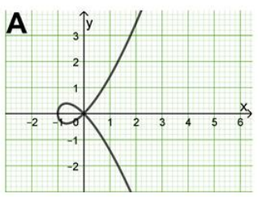
A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

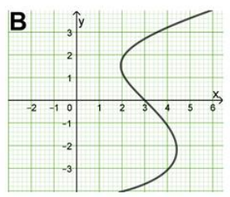
32. The result of $\lim_{\Delta x\to0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

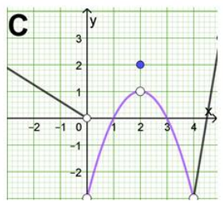
33. Which of the following is true ?

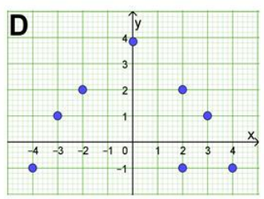
A. $\lim_{x\to+\infty} (2 + \frac{sinx}{x}) = 2$ **B.** $\lim_{x\to2} \frac{3}{x-2} = 3$ **C.** $\lim_{x\to1} \frac{x^2-1}{x-1} = 0$ **D.** $\lim_{x\to0} \frac{sinx}{x} = 0$

34. Which of the following graphs represents a function ?

A 

B 

C 

D 

35. Depending on the intermediate value theorem (IVT). If the function ***f*** is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)\ and\ f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

36. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty, 0[$ **B.** $]-\infty, 4[$ **C.** $]0, +\infty[$ **D.** None

37. Find the result of $\lim_{x\to+\infty} \frac{ln\,x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

38. Assume that x and y are two differentiable of a variable t . If $y = x^3 + 1$.

Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D.** $\frac{-1}{2}$

39. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D.** $(-1, 2)$

40. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

41. If $f\ and\ g$ are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

A. $(f\,g' - f'\,g)' = f'g'' - f''g'$ B. $fg'' + f''g = (f\,g)''$

C. $(f'g')' = f''g''$ D. $(f\,g)'' = f\,g'' + 2f'g' + f''g$

42. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

43. The result of $\lim_{x\to-2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

44. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A. $]-1, 1[$ **B.** $]-\infty, -1[$ **C.** $]-1, +\infty[$ **D.** $None$

45. The function $f(x) = \frac{-1}{x+2}$ is always ……. in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

46. Find the equation of the line that passes through the point $(-4, 1)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

47. Find the result of $\lim_{x\to0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D.** $\frac{1}{2\sqrt{5}}$

48. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2, \sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

49. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

50. The result of $\lim_{x\to0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

Kurdistan Region – Iraq SN: 30000005 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

Choose the correct option, two marks for each right answer

1. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

2. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

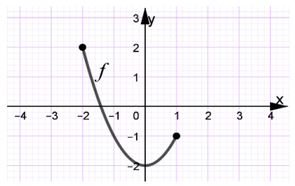
3. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

4. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1\,,0)$ **B.** $(2\,,0)$ **C.** $(0\,,0)$ **D.** None

5. Determine the range of the function f from the given graph on the right .



A.$[-2\,,2]$ **B.** $[-2\,,1]$

C.$[-1\,,2]$ **D.** $[0\,,2]$

6. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

7. Assume that x and y are two differentiable of a variable t . If $y = x^3 + 1$.

Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

8. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5\,,-3)$ **B.** $(-3\,,5)$ **C.** $(2\,,-1)$ **D .** $(-1\,,2)$

9. Find the result of $\lim_{x\to 0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

10. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m\,,200\ m$ **B.** $400\ m\,,128\ m$ **C.** $512\ m\,,100\ m$ **D.** $320\ m\,,160\ m$

11. Which of the following is false ?

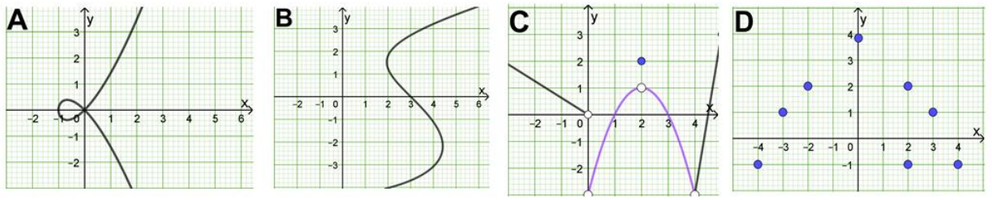
A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

12. Which of the following graphs represents a function ?



13. In a fireworks festival, a rocket is launched upward .The function $S(t) = -16t^2 + 192\,t + 4$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

14. Depending on the intermediate value theorem (IVT). If the function f is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)\ and\ f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

15. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

16. Find the derivative of the function $f(x) = x\,e^x$.

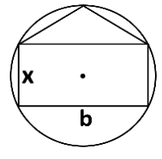
A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

17. Find the result of $\lim_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

18. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

19. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

20. The result of $\lim_{\Delta x\to 0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

21. For what value of a , does the function $f(x) = \begin{cases} ax^2 + 1 & x \le 2 \\ 2x - a & x > 2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

22. The function $f(x) = \frac{-1}{x+2}$ is always ……. in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

23. The result of $\lim_{x\to -1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

24. Find the value of b when the distance between the point $(1\,,-3)$ and the line $3x - by = 5$ is$(zero)$

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

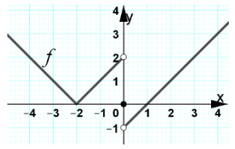
25. Find the equation of a line passing through the points $(-2\,,-4)$ and $(-2\,,4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

26. The result of $\lim\limits_{x\to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

27. Use the given graph on the right to find the result of $\lim\limits_{x\to 0^+} f(x)$

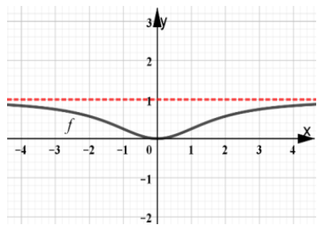
A. 0 **B.** -1 **C.** 2 **D.** Does not exist.



28. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .

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

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



29. Which of the following functions has no vertical asymptote at $x=2$?

A. $f(x)=\frac{x^2-4}{(x-2)^2}$ **B.** $f(x)=\frac{x+2}{x^2-4}$ **C.** $f(x)=\frac{x^2+4}{x^2-3x+2}$ **D** .$f(x)=\frac{x^2+x-6}{2x^2-8}$

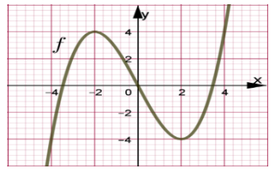
30. Find the slope of the tangent line to the graph $y^2=\frac{x+1}{x-1}$ at the point $(2,\sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

31. The given graph on the right shows the curve of the function f On which interval is f' increasing ?

A. $]-\infty,0[$ **B.** $]0,+\infty[$

C. $]-\infty,0[\cup]0,+\infty[$ **D.** $]-\infty,+\infty[$



32. The result of $\lim\limits_{x\to -2} \frac{\frac{1}{1-x}-\frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

33. If $f(x)=x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

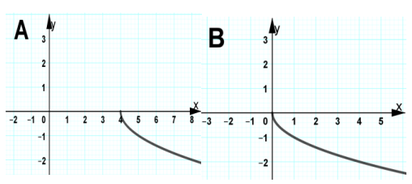
A. x^2-2x **B.** x^2+2x **C.** x^2+2x+4 **D.** x^2-2x+4

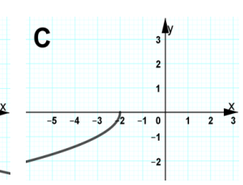
34. If f *and* g are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

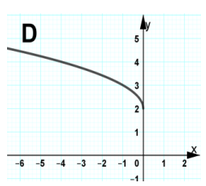
A. $(f\,g'-f'g)'=f'g''-f''g'$ B. $fg''+f''g=(f\,g)''$

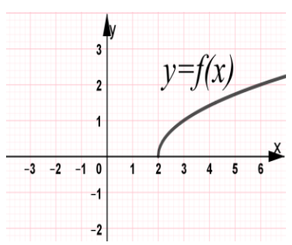
C. $(f'g')'=f''g''$ D. $(f\,g)''=f\,g''+2f'g'+f''g$

35. Use the given graph of the function $y=f(x)$ on the right , to determine the graph of the function $y=-f(x-2)$









36. Find the result of $\lim\limits_{x\to+\infty} \frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

37. Find the result of $\lim\limits_{x\to-\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

38. IF $f(x)=3ax^3+3$ is a function and $f'(3)=-162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

39. If $f(x)=2x-4$ *and* $g(x)=1+3x$, find the value of x when $f(x)=g(x)$.

A. $x=-1$ **B.** $x=1$ **C.** $x=5$ **D.** $x=-5$

40. Find the equation of the line that passes through the point $(-4,1)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

41. Which of the following functions has a removable discontinuity at $x=-3$?

A. $f(x)=\frac{x^2-9}{(x+3)^2}$ **B.** $f(x)=\frac{x^3+27}{2x+6}$ **C.** $f(x)=\frac{x^2+9}{x+3}$ **D.** $f(x)=\frac{|x+3|}{2x+6}$

42. Which of the following is true ?

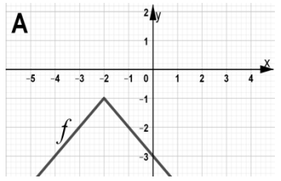
A. $\lim\limits_{x\to+\infty}(2+\frac{sinx}{x})=2$ **B.** $\lim\limits_{x\to 2}\frac{3}{x-2}=3$ **C.** $\lim\limits_{x\to 1}\frac{x^2-1}{x-1}=0$ **D.** $\lim\limits_{x\to 0}\frac{sinx}{x}=0$

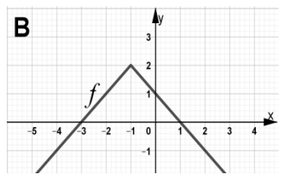
43. On which interval is the function $f(x)=x^{\frac{2}{3}}-4$ decreasing ?

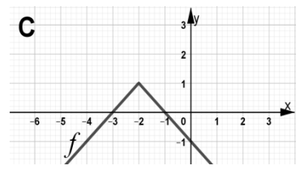
A. $]-\infty,0[$ **B.** $]-\infty,4[$ **C.** $]0,+\infty[$ **D.** None

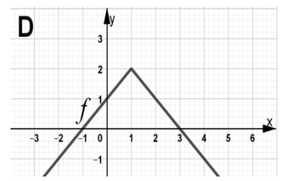
44. The result of $\lim\limits_{x\to 0}\frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

45. Determine the graph of the function $f(x)=2-|x+1|$ by using point plotting.









46. On which interval is the function $f(x)=\frac{x-1}{x+1}$ convex ?

A. $]-1,1[$ **B.** $]-\infty,-1[$ **C.** $]-1,+\infty[$ **D.** *None*

47. Redefine the function $f(x)=\frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x=1$.

A. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ 1 & x=1\end{cases}$ **B.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ \sqrt{2} & x=1\end{cases}$

C. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ 0 & x=1\end{cases}$ **D.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ -1 & x=1\end{cases}$

48. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

49. Find the third derivative of the function $f(x)=\frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x)=\frac{-24}{x^4}$ **B.** $f'''(x)=\frac{24}{x^4}$ **C.** $f'''(x)=\frac{-96}{x^5}$ **D.** $f'''(x)=\frac{96}{x^5}$

50. Find the value of $\boldsymbol{k}$ such that the line $y=\frac{3}{4}x+3$ is tangent to the graph of the function $f(x)=\frac{-k}{x}$. **A.** $k=2$ **B.** $k=-2$ **C.** $k=3$ **D.** $k=-3$

Kurdistan Region – Iraq SN: 30000006 In the Name of Allah Name: _____

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

General exams for preparatory stage (science) For the Academic year (2020-2021) First attemp 71054

Choose the correct option, two marks for each right answer

1. Assume that x and y are two differentiable of a variable t. If $y = x^3 + 1$.
Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

2. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .** $f(x) = \frac{x^2+x-6}{2x^2-8}$

3. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

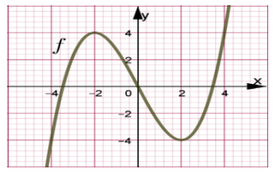
4. Which of the following is true ?

A. $\lim_{x\to+\infty}(2 + \frac{sinx}{x}) = 2$ **B.** $\lim_{x\to2} \frac{3}{x-2} = 3$ **C.** $\lim_{x\to1} \frac{x^2-1}{x-1} = 0$ **D.** $\lim_{x\to0} \frac{sinx}{x} = 0$

5. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A. $]-1, 1[$ **B.** $]-\infty, -1[$ **C.** $]-1, +\infty[$ **D.** *None*

6. The given graph on the right shows the curve of the function f
On which interval is f' increasing ?



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

7. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

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9. Depending on the intermediate value theorem (IVT). If the function f is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are ……

A. Positive **B.** Negative **C.** Opposite **D.** None

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What is the highest point the rocket can reach ?

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11. Find the result of $\lim_{x\to-\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

12. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

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A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

16. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty, 0[$ **B.** $]-\infty, 4[$ **C.** $]0, +\infty[$ **D.** None

17. The result of $\lim_{\Delta x\to0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

18. Find the value of b when the distance between the point $(1, -3)$ and the line $3x - by = 5$ is $(zero)$

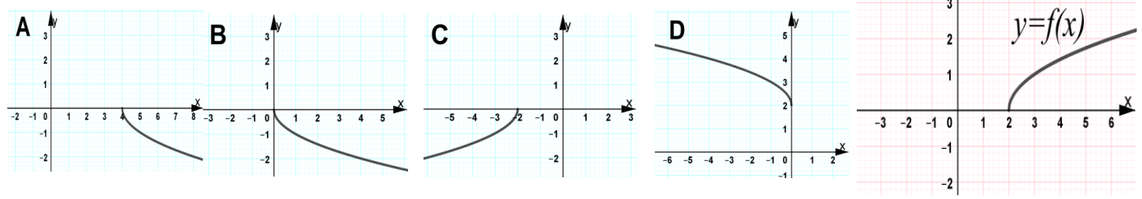
A. $\frac{3}{2}$ **B.** $\frac{-3}{2}$ **C.** $\frac{2}{3}$ **D.** $\frac{-2}{3}$

19. For what value of a , does the function $f(x) = \begin{cases} ax^2 + 1 & x \leq 2 \\ 2x - a & x > 2 \end{cases}$ has no points of discontinuity?

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

20. The result of $\lim_{x\to-2} \frac{\frac{1}{1-x}-\frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

21. Use the given graph of the function $y = f(x)$ on the right ,
to determine the graph of the function $y = -f(x-2)$



A

B

C

D

22. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

23. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

24. The volume of a cube increases an average of $(36\ cm^3/min)$, while its surface area increases $(18\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

25. Find the value of k such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-k}{x}$. **A.** $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

26. Find the result of $\lim_{x\to0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

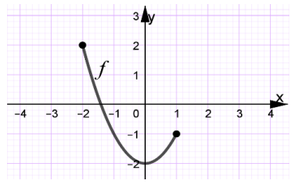
27. If f *and* g are two differentiable function for all x, and so are their derivatives.
Which of the following is true ?

A. $(f\,g' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (f\,g)''$
C. $(f'g')' = f''g''$ D. $(f\,g)'' = f\,g'' + 2f'g' + f''g$

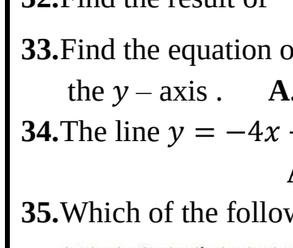
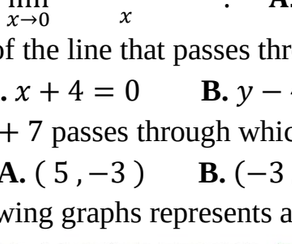
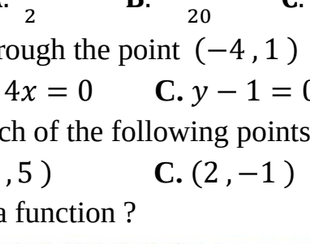
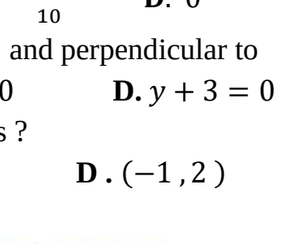
28. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.
A. $[-2\,,2\,]$ **B.** $[\,0\,,2\,]$ **C.** $]-\infty\,,-2]\cup[2\,,+\infty[$ **D.** $[-2\,,0\,]$

29. The result of $\lim_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

30. Determine the range of the function f from the given graph on the right .
A. $[-2\,,2]$ **B.** $[-2\,,1]$
C. $[-1\,,2]$ **D.** $[0\,,2]$



31. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.

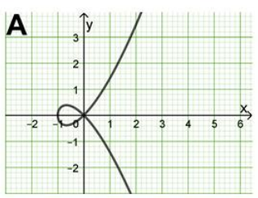
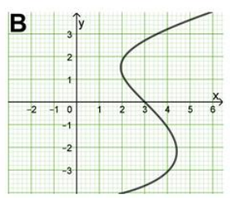
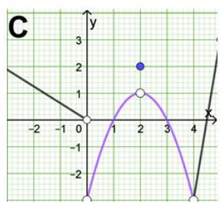
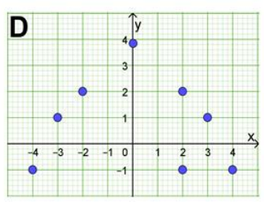
A

B

C

D


32. Find the result of $\lim_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

33. Find the equation of the line that passes through the point $(-4\,,1\,)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

34. The line $y = -4x + 7$ passes through which of the following points ?
A. $(\,5\,,-3\,)$ **B.** $(-3\,,5\,)$ **C.** $(2\,,-1\,)$ **D .** $(-1\,,2\,)$

35. Which of the following graphs represents a function ?

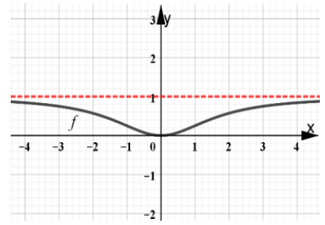
A

B

C

D


36. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.
A. 2 **B.** -51 **C.** 51 **D.** -45

37. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2\,,\sqrt{3}\,)$.
A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

38. If $f(x) = 2\,(sinx\,)\,(\,cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

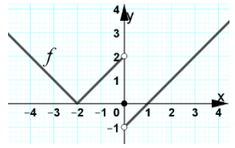
39. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .
A. $f(x) = \frac{x^2}{x^2+3}$ **B.** $f(x) = \frac{x}{x^2+3}$
C. $f(x) = \frac{x^2}{x^2-3}$ **D.** $f(x) = \frac{x^2-1}{x^2+3}$



40. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.
A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

41. Which of the following is false ?
A. The graph of a cubic function has exactly one point of inflection.
B. If $f'(x) = g'(x)$, then $f(x) = g(x)$
C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$
D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

42. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$
A. 0 **B.** -1 **C.** 2 **D.** Does not exist.



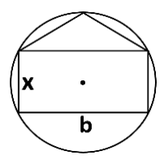
43. Find the result of $\lim_{x\to+\infty} \frac{ln\,x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

44. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.
A. $256\ m\,,200\ m$ **B.** $400\ m\,,128\ m$ **C.** $512\ m\,,100\ m$ **D.** $320\ m\,,160\ m$

45. The result of $\lim_{x\to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

46. Find the equation of a line passing through the points $(-2\,,-4)$ and $(-2\,,4\,)$.
A. $x=-2$ **B.** $y=-2$ **C.** $y=-4$ **D.** $y=-2x-8$

47. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?
A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2



48. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?
A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

49. Find the derivative of the function $f(x) = x\,e^x$.
A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

50. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.
A. $x=-1$ **B.** $x=1$ **C.** $x=5$ **D.** $x=-5$

Kurdistan Region – Iraq SN: 30000007 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

Choose the correct option, two marks for each right answer

1. The result of $\lim\limits_{x\to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

2. Find the value of $\boldsymbol{b}$ when the distance between the point $(1,-3)$ and the line $3x-\boldsymbol{b}y=5$ is$(zero)$

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

3. Which of the following functions has a removable discontinuity at $x=-3$?

A. $f(x)=\frac{x^2-9}{(x+3)^2}$ **B.** $f(x)=\frac{x^3+27}{2x+6}$ **C.** $f(x)=\frac{x^2+9}{x+3}$ **D.** $f(x)=\frac{|x+3|}{2x+6}$

4. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

5. Which of the following is true ?

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

6. On which interval is the function $f(x)=\frac{x-1}{x+1}$ convex ?

A. $]-1,1[$ **B.** $]-\infty,-1[$ **C.** $]-1,+\infty[$ **D.** $None$

7. IF $f(x)=3ax^3+3$ is a function and $f'(3)=-162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

8. Find the value of $\boldsymbol{k}$ such that the line $y=\frac{3}{4}x+3$ is tangent to the graph of the function $f(x)=\frac{-\boldsymbol{k}}{\boldsymbol{x}}$. **A.** $k=2$ **B.** $k=-2$ **C.** $k=3$ **D.** $k=-3$

9. Assume that $\boldsymbol{x}$ and $\boldsymbol{y}$ are two differentiable of a variable $\boldsymbol{t}$. If $y=x^3+1$.

Find $\frac{dx}{dt}$ at $x=2$, by knowing that $\frac{dy}{dt}=-3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D.** $\frac{-1}{2}$

10. Depending on the intermediate value theorem (IVT). If the function $\boldsymbol{f}$ is continuous between ($x=a$ and $x=b$) , then the equation $f(x)=0$ has at least one root between two numbers **a** and **b** when the signs $f(a)\ and\ f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

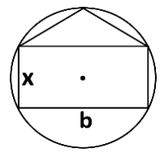
11. For what value of $\boldsymbol{a}$, does the function $f(x)=\begin{cases}\boldsymbol{a}x^2+1 & x\le 2\\ 2x-\boldsymbol{a} & x>2\end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D.** $\frac{3}{5}$

12. Find the equation of the line that passes through the point $(-4,1)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

13. The result of $\lim\limits_{x\to-1}\frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

14. The result of $\lim\limits_{x\to-2}\frac{\frac{1}{1-x}-\frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

15. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

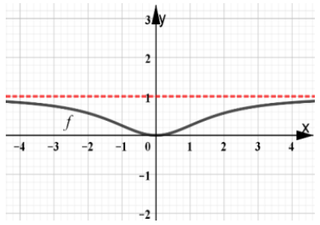
16. Find the point of inflection for the function $f(x)=3x(x-1)(x-2)$.

A. $(1,0)$ **B.** $(2,0)$ **C.** $(0,0)$ **D.** None

17. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .

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

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



18. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

19. On which interval is the function $f(x)=x^{\frac{2}{3}}-4$ decreasing ?

A. $]-\infty,0[$ **B.** $]-\infty,4[$ **C.** $]0,+\infty[$ **D.** None

20. Find the result of $\lim\limits_{x\to 0}\frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D.** $\frac{1}{2\sqrt{5}}$

21. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t)=-16t^2+192\,t+4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

22. Which of the following functions is symmetric with respect to the y - axis ?

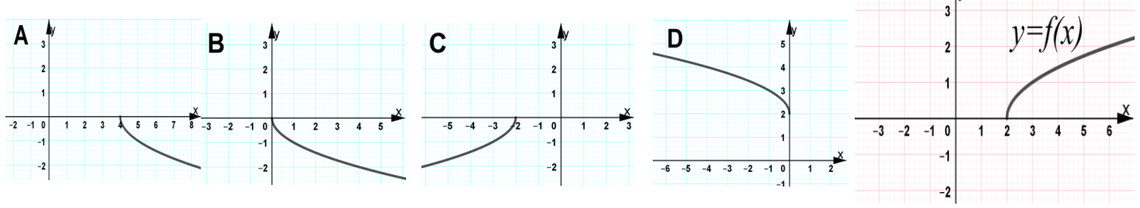
A. $x^2y-x^2+3y=0$ **B.** $y=\sqrt{x-4}$ **C.** $y=|x+2|-2$ **D.** $x^2y-x=0$

23. If $f\ and\ g$ are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

A. $(f\,g'-f'g)'=f'g''-f''g'$ B. $fg''+f''g=(f\,g)''$

C. $(f'g')'=f''g''$ D. $(f\,g)''=f\,g''+2f'g'+f''g$

24. Use the given graph of the function $y=f(x)$ on the right , to determine the graph of the function $y=-f(x-2)$



25. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .** $f(x) = \frac{x^2+x-6}{2x^2-8}$

26. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

27. Find the equation of a line passing through the points $(-2\,,-4)$ and $(-2\,,4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

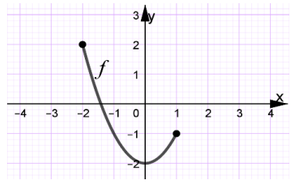
28. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

29. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

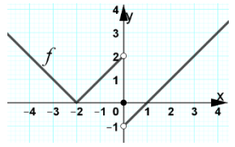
30. Determine the range of the function f from the given graph on the right .



A.$[-2\,,2]$ **B.** $[-2\,,1]$

C.$[-1\,,2]$ **D.** $[0\,,2]$

31. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$



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

32. The result of $\lim_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

33. The result of $\lim_{\Delta x\to 0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

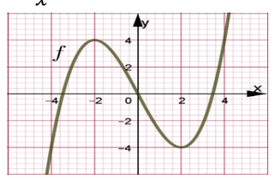
34. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

35. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

36. The given graph on the right shows the curve of the function f On which interval is f' increasing ?



A. $]-\infty\,,0[$ **B.** $]0\,,+\infty[$

C. $]-\infty\,,0[\cup]0\,,+\infty[$ **D.** $]-\infty\,,+\infty[$

37. Find the derivative of the function $f(x) = x\,e^x$.

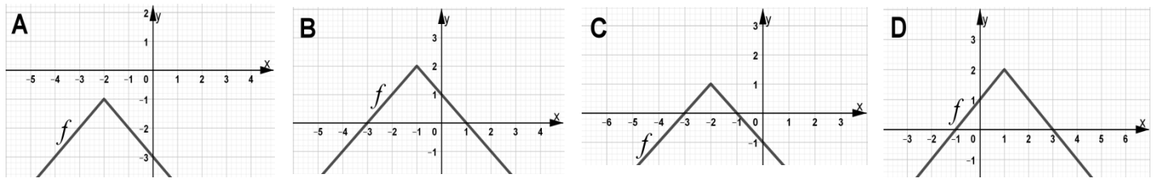
A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

38. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

39. Find the result of $\lim_{x\to-\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

40. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.



41. The function $f(x) = \frac{-1}{x+2}$ is always ..... in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

42. Find the result of $\lim_{x\to+\infty} \frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

43. The line $y = -4x + 7$ passes through which of the following points ?

A. $(\,5\,,-3\,)$ **B.** $(-3\,,5\,)$ **C.** $(2\,,-1\,)$ **D .** $(-1\,,2\,)$

44. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

45. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

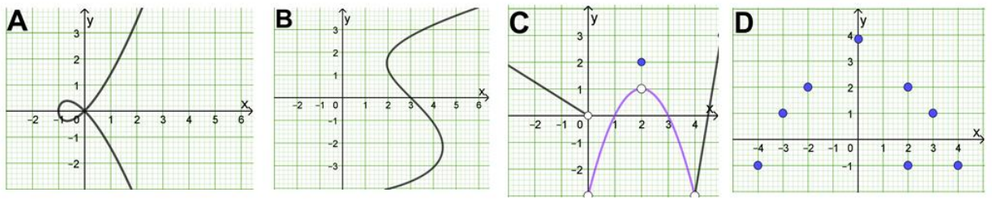
D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

46. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

47. Which of the following graphs represents a function ?



48. Find the result of $\lim_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

49. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

50. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2\,,\sqrt{3}\,)$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

Kurdistan Region – Iraq SN: 30000008 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

Choose the correct option, two marks for each right answer

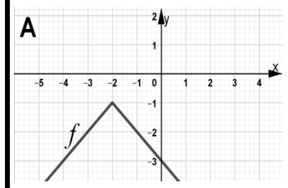
1. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

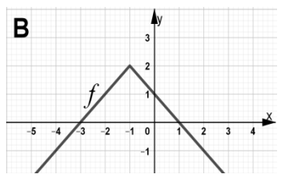
2. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2\,,\sqrt{3}\,)$.

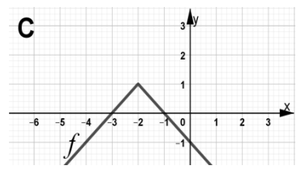
A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

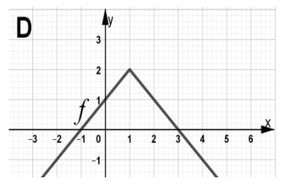
3. Find the result of $\lim_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

4. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.

A 

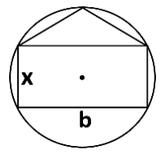
B 

C 

D 

5. Find the equation of the line that passes through the point $(-4\,,1\,)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

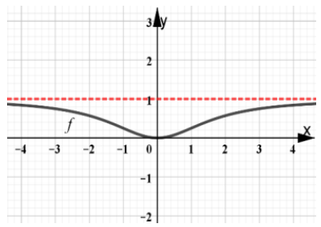
6. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

7. Find the result of $\lim_{x\to 0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

8. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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

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

9. For what value of a , does the function $f(x) = \begin{cases} ax^2+1 & x \le 2 \\ 2x-a & x > 2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

10. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

11. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

12. The result of $\lim_{x\to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

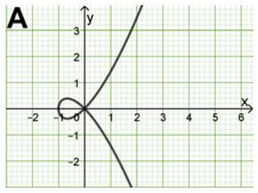
13. In a fireworks festival, a rocket is launched upward .The function $S(t) = -16t^2 + 192\,t + 4$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

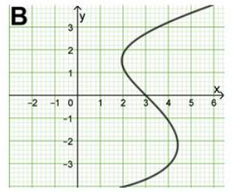
What is the highest point the rocket can reach ?

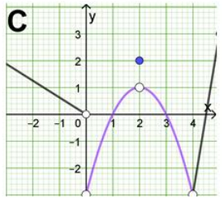
A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

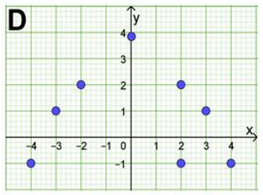
14. The result of $\lim_{x\to -2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

15. Which of the following graphs represents a function ?

A 

B 

C 

D 

16. Depending on the intermediate value theorem (IVT). If the function f is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)\ and\ f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

17. Find the value of b when the distance between the point$(\,1\,,-3)$ and the line $3x - by = 5$ is$(zero)$

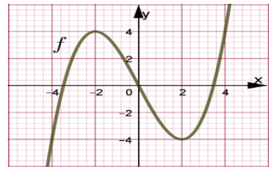
A. $\frac{3}{2}$ **B.** $\frac{-3}{2}$ **C.** $\frac{2}{3}$ **D.** $\frac{-2}{3}$

18. The function $f(x) = \frac{-1}{x+2}$ is always ……. in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

19. The given graph on the right shows the curve of the function f

On which interval is f' increasing ?



A. $]-\infty\,,0[$ **B.** $]0\,,+\infty[$

C. $]-\infty\,,0[\cup]0\,,+\infty[$ **D.** $]-\infty\,,+\infty[$

20. The result of $\lim_{x\to -1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

21. Find the result of $\lim_{x\to -\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

22. If $f\ and\ g$ are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

A. $(f\,g' - f'\,g\,)' = f'g'' - f''g'$ B. $fg'' + f''g = (\,f\,g\,)''$

C. $(f'g')' = f''g''$ D. $(\,f\,g\,)'' = f\,g'' + 2f'g' + f''g$

23. Find the result of $\lim_{x\to +\infty} \frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

24. The result of $\lim_{\Delta x\to 0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

25. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

26. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty\,,0\,[$ **B.** $]-\infty\,,4\,[$ **C.** $]\,0\,,+\infty[$ **D.** None

27. The result of $\lim_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

28. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D.** $(-1, 2)$

29. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

30. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

31. Find the equation of a line passing through the points $(-2, -4)$ and $(-2, 4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

32. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B. If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

33. Which of the following is true ?

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

34. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

35. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

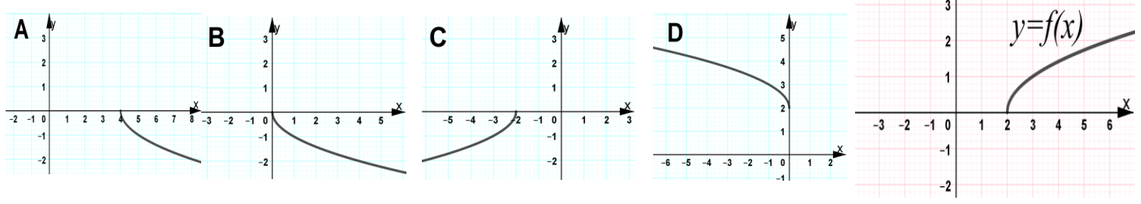
A. $]-1, 1[$ **B.** $]-\infty, -1[$ **C.** $]-1, +\infty[$ **D.** *None*

36. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

37. Use the given graph of the function $y = f(x)$ on the right , to determine the graph of the function $y = -f(x-2)$



38. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

39. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

40. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D.** $f(x) = \frac{x^2+x-6}{2x^2-8}$

41. Assume that x and y are two differentiable of a variable t . If $y = x^3 + 1$.

Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D.** $\frac{-1}{2}$

42. Which of the following functions is symmetric with respect to the y - axis ?

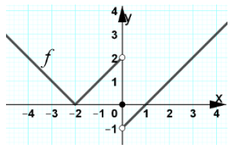
A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

43. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

44. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$

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



45. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

46. Find the value of k such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-k}{x}$.

A. $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

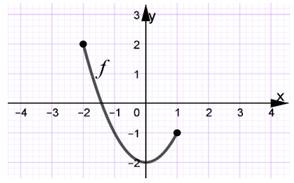
47. Which of the following functions has a removable discontinuity at $x = -3$?

A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

48. Determine the range of the function f from the given graph on the right .

A. $[-2, 2]$ **B.** $[-2, 1]$

C. $[-1, 2]$ **D.** $[0, 2]$



49. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

50. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

Kurdistan Region – Iraq SN: 30000009 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

Choose the correct option, two marks for each right answer

1. Find the value of $\boldsymbol{b}$ when the distance between the point $(1,-3)$ and the line $3x-\boldsymbol{b}y=5$ is$(zero)$

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

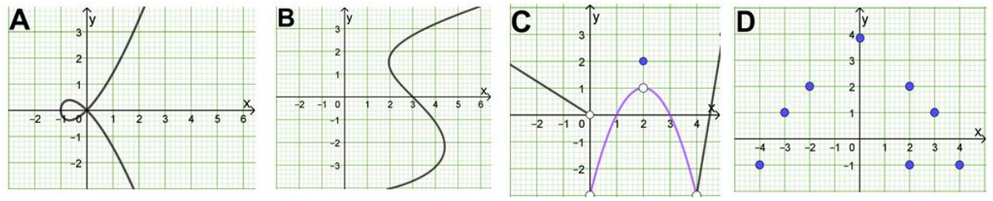
2. Find the slope of the tangent line to the graph $y^2=\frac{x+1}{x-1}$ at the point $(2,\sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

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

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

4. Which of the following graphs represents a function ?

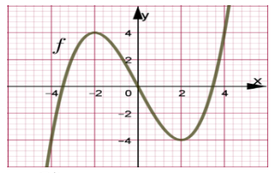


5. The given graph on the right shows the curve of the function f

On which interval is f' increasing ?

A. $]-\infty,0[$ **B.** $]0,+\infty[$

C. $]-\infty,0[\cup]0,+\infty[$ **D.** $]-\infty,+\infty[$



6. Find the point of inflection for the function $f(x)=3x(x-1)(x-2)$.

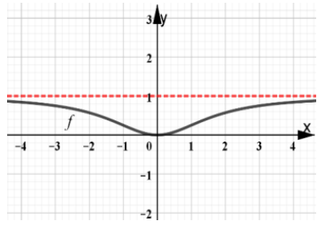
A. $(1,0)$ **B.** $(2,0)$ **C.** $(0,0)$ **D.** None

7. If $f(x)=2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

8. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .

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

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



9. The line $y=-4x+7$ passes through which of the following points ?

A. $(5,-3)$ **B.** $(-3,5)$ **C.** $(2,-1)$ **D .** $(-1,2)$

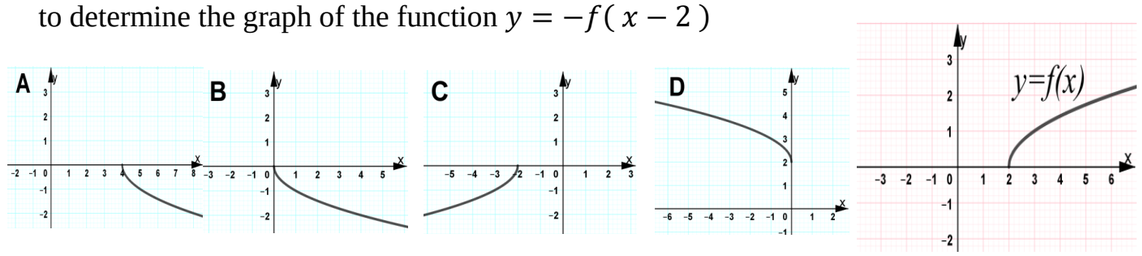
10. On which interval is the function $f(x)=x^{\frac{2}{3}}-4$ decreasing ?

A. $]-\infty,0[$ **B.** $]-\infty,4[$ **C.** $]0,+\infty[$ **D.** None

11. The function $f(x)=\frac{-1}{x+2}$ is always ..... in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

12. Use the given graph of the function $y=f(x)$ on the right , to determine the graph of the function $y=-f(x-2)$



13. On which interval is the function $f(x)=\frac{x-1}{x+1}$ convex ?

A. $]-1,1[$ **B.** $]-\infty,-1[$ **C.** $]-1,+\infty[$ **D.** *None*

14. Depending on the intermediate value theorem (IVT). If the function $\boldsymbol{f}$ is continuous between $(x=a$ and $x=b)$, then the equation $f(x)=0$ has at least one root between two numbers **a** and **b** when the signs $f(a)\ and\ f(b)$ are .....

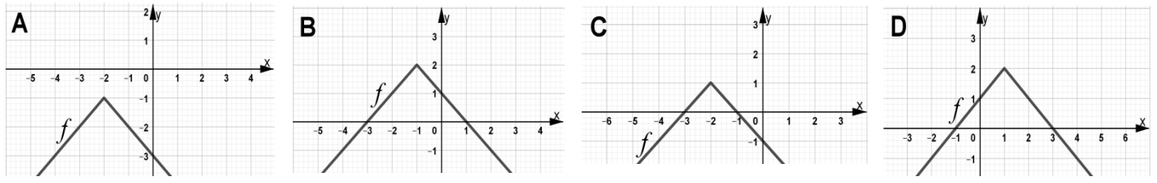
A. Positive **B.** Negative **C.** Opposite **D.** None

15. The result of $\lim\limits_{\Delta x\to 0}\frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

16. Which of the following is true ?

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

17. Determine the graph of the function $f(x)=2-|x+1|$ by using point plotting.



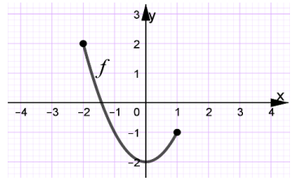
18. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m\,,200\ m$ **B.** $400\ m\,,128\ m$ **C.** $512\ m\,,100\ m$ **D.** $320\ m\,,160\ m$

19. Determine the range of the function f from the given graph on the right .

A.$[-2,2]$ **B.** $[-2,1]$

C.$[-1,2]$ **D.** $[0,2]$



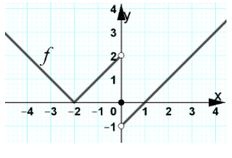
20. Find the equation of a line passing through the points $(-2,-4)$ and $(-2,4)$.

A. $x=-2$ **B.** $y=-2$ **C.** $y=-4$ **D.** $y=-2x-8$

21. The result of $\lim\limits_{x\to 0}\frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

22. Use the given graph on the right to find the result of $\lim\limits_{x\to 0^+}f(x)$

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



23. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

24. For what value of $\boldsymbol{a}$, does the function $f(x) = \begin{cases} ax^2 + 1 & x \le 2 \\ 2x - a & x > 2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

25. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

26. Find the result of $\lim\limits_{x\to-\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

27. Which of the following functions has a removable discontinuity at $x = -3$?

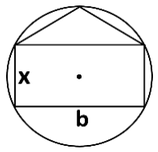
A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

28. Find the result of $\lim\limits_{x\to0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

29. The result of $\lim\limits_{x\to-1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

30. Find the value of $\boldsymbol{k}$ such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-\boldsymbol{k}}{\boldsymbol{x}}$. **A.** $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

31. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

32. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

33. The result of $\lim\limits_{x\to3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

34. If f *and* g are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

A. $(f\,g' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (f\,g)''$

C. $(f'g')' = f''g''$ D. $(f\,g)'' = f\,g'' + 2f'g' + f''g$

35. Assume that $\boldsymbol{x}$ and $\boldsymbol{y}$ are two differentiable of a variable $\boldsymbol{t}$. If $y = x^3 + 1$. Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

36. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

37. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .** $f(x) = \frac{x^2+x-6}{2x^2-8}$

38. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \ne 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \ne 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \ne 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \ne 1 \\ -1 & x = 1 \end{cases}$

39. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

40. Find the equation of the line that passes through the point $(-4, 1)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

41. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t) = -16t^2 + 192\,t + 4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

42. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

43. Find the result of $\lim\limits_{x\to+\infty} \frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

44. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

45. Find the result of $\lim\limits_{x\to0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

46. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

47. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

48. The result of $\lim\limits_{x\to-2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

49. The volume of a cube increases an average of $(\boldsymbol{36}\ cm^3/min)$, while its surface area increases $(\boldsymbol{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

50. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

Kurdistan Region – Iraq SN: 30000010 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp**

J

71054

Choose the correct option, two marks for each right answer

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5. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty, 0[$ **B.** $]-\infty, 4[$ **C.** $]0, +\infty[$ **D.** None

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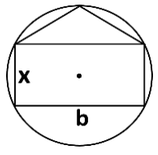

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15. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

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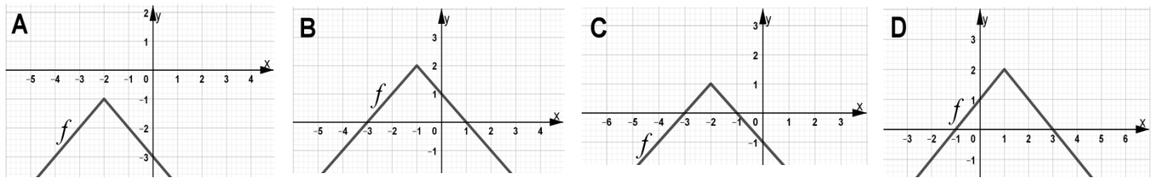

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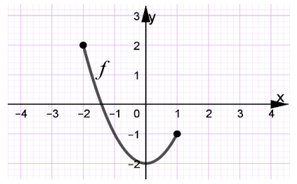
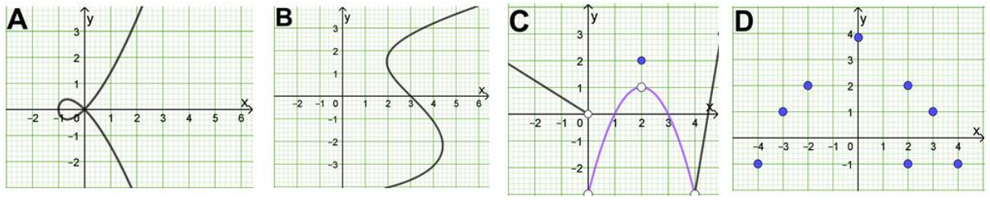


19. Which of the following graphs represents a function ?



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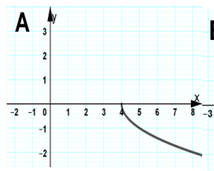
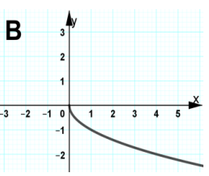
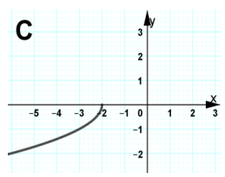
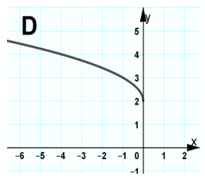
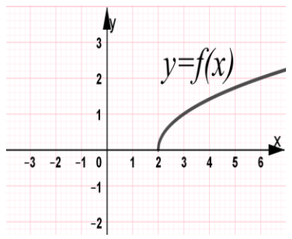
A 

B 

C 

D 



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29. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A. $]-1,1[$ **B.** $]-\infty,-1[$ **C.** $]-1,+\infty[$ **D.** *None*

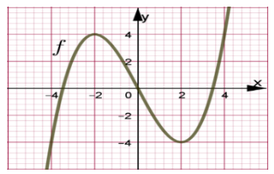
30. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

31. Depending on the intermediate value theorem (IVT). If the function ***f*** is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

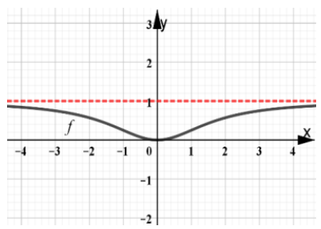
A. Positive **B.** Negative **C.** Opposite **D.** None

32. The given graph on the right shows the curve of the function f
On which interval is f' increasing ?



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

33. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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

34. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

35. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2,\sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

36. Find the value of ***b*** when the distance between the point $(1,-3)$ and the line $3x - by = 5$ is $(zero)$

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

37. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

38. Assume that ***x*** and ***y*** are two differentiable of a variable ***t*** . If $y = x^3 + 1$.
Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D.** $\frac{-1}{2}$

39. The result of $\lim\limits_{x\to3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

40. The result of $\lim\limits_{x\to-1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

41. Find the equation of the line that passes through the point $(-4,1)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

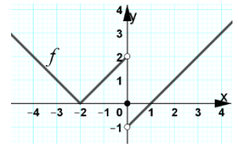
42. Find the equation of a line passing through the points $(-2,-4)$ and $(-2,4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

43. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t) = -16t^2 + 192\,t + 4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet
What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

44. Use the given graph on the right to find the result of $\lim\limits_{x\to0^+} f(x)$



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

45. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1,0)$ **B.** $(2,0)$ **C.** $(0,0)$ **D.** None

46. The volume of a cube increases an average of $(\boldsymbol{36}\ cm^3/min)$, while its surface area increases $(\boldsymbol{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

47. The function $f(x) = \frac{-1}{x+2}$ is always ……. in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

48. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

49. The result of $\lim\limits_{\Delta x\to0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

50. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.
B. If $f'(x) = g'(x)$, then $f(x) = g(x)$
C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$
D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

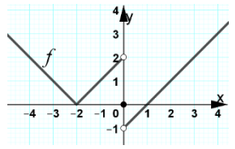
Kurdistan Region – Iraq SN: 30000011 **In the Name of Allah** **Name:** _____

High Committee for General Examinations **Subject: Maths** **Time: 3:30 Hours** **K** 71054

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp**

Choose the correct option, two marks for each right answer

1. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$



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

2. The result of $\lim_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

3. Find the result of $\lim_{x\to -\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

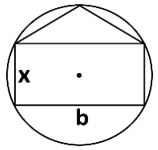
4. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

5. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

6. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

7. Assume that x and y are two differentiable of a variable t . If $y = x^3 + 1$.

Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D.** $\frac{-1}{2}$

8. Which of the following is true ?

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

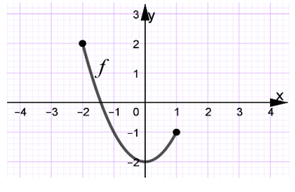
9. Find the equation of a line passing through the points $(-2, -4)$ and $(-2, 4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

10. Depending on the intermediate value theorem (IVT). If the function f is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

11. Determine the range of the function f from the given graph on the right .



A.$[-2, 2]$ **B.** $[-2, 1]$

C.$[-1, 2]$ **D.** $[0, 2]$

12. Find the value of k such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-k}{x}$. **A.** $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

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

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

14. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

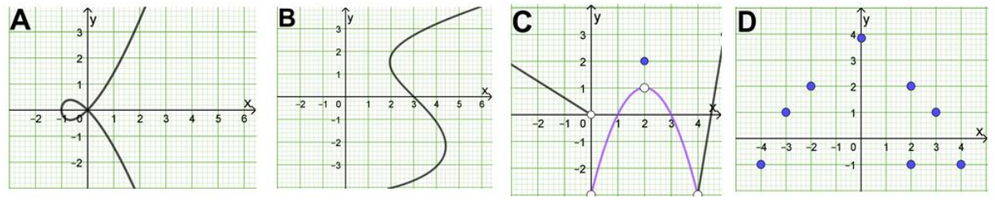
A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

15. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D .** $(-1, 2)$

16. For what value of a , does the function $f(x) = \begin{cases} ax^2 + 1 & x \le 2 \\ 2x - a & x > 2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

17. Which of the following graphs represents a function ?



18. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

19. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A.$]-1, 1[$ **B.** $]-\infty, -1[$ **C.**$]-1, +\infty[$ **D.** *None*

20. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x + 1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

21. The function $f(x) = \frac{-1}{x+2}$ is always ……. in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

22. Find the result of $\lim_{x\to+\infty} \frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

23. Which of the following functions has a removable discontinuity at $x = -3$?

A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

24. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

25. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

26. The result of $\lim_{x\to-1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

27. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D** . $f(x) = \frac{x^2+x-6}{2x^2-8}$

28. The result of $\lim_{x\to3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

29. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D** . -2

30. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty, 0[$ **B.** $]-\infty, 4[$ **C.** $]0, +\infty[$ **D.** None

31. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

32. If f *and* g are two differentiable function for all x , and so are their derivatives.
Which of the following is true ?

A. $(f\,g' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (f\,g)''$

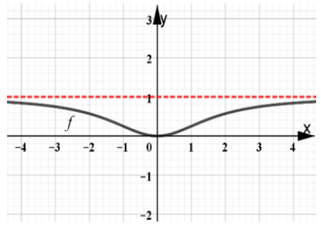
C. $(f'g')' = f''g''$ D. $(f\,g)'' = f\,g'' + 2f'g' + f''g$

33. Find the result of $\lim_{x\to0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

34. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

35. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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

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

36. Find the equation of the line that passes through the point $(-4, 1)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

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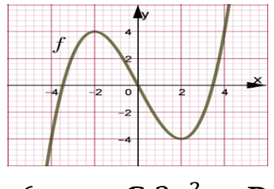
On which interval is f' increasing ?



A. $]-\infty, 0[$ **B.** $]0, +\infty[$

C. $]-\infty, 0[\cup]0, +\infty[$ **D.** $]-\infty, +\infty[$

38. The result of $\lim_{\Delta x\to0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

39. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

40. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

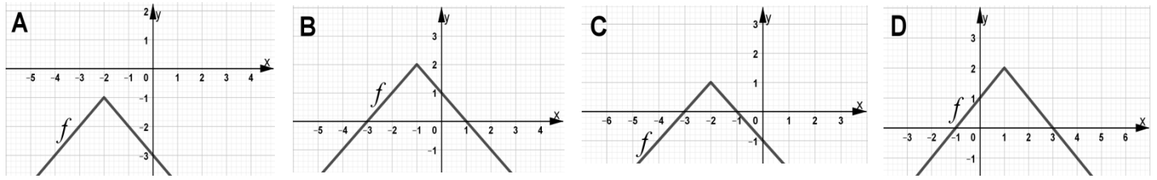
41. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

42. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

43. Determine the graph of the function $f(x) = 2 - |x + 1|$ by using point plotting.



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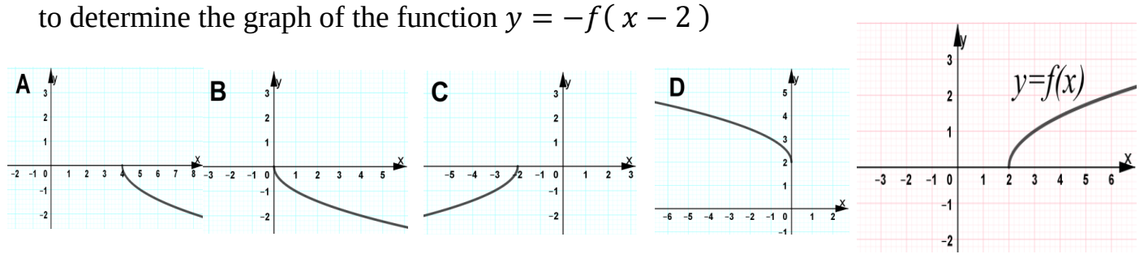
A. 2 cm **B.** 4 cm **C.** $2\sqrt{2}$ cm **D.** 8 cm

45. The result of $\lim_{x\to-2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

46. Use the given graph of the function $y = f(x)$ on the right ,
to determine the graph of the function $y = -f(x-2)$



47. Find the result of $\lim_{x\to0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D** . $\frac{1}{2\sqrt{5}}$

48. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

49. Find the value of $\boldsymbol{b}$ when the distance between the point $(1, -3)$ and the line $3x - \boldsymbol{b}y = 5$ is$(zero)$

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

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What is the highest point the rocket can reach ?

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Kurdistan Region – Iraq SN: 30000012 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp**

L 71054

Choose the correct option, two marks for each right answer

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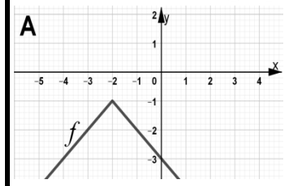
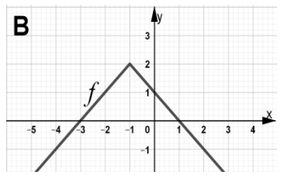
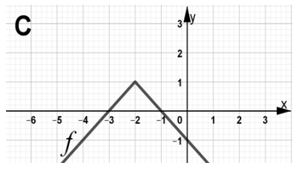
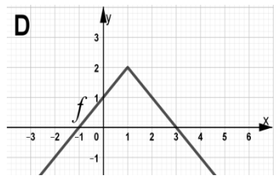
A 

B 

C 

D 

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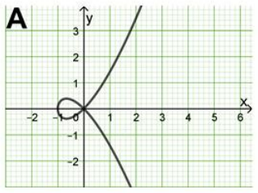
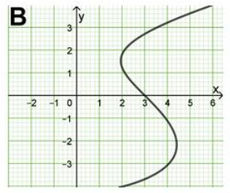
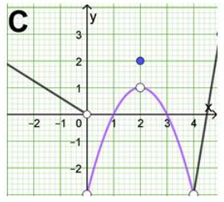
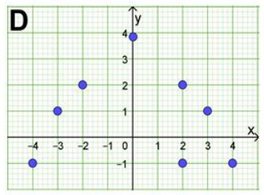
A 

B 

C 

D 

6. Find the value of $\boldsymbol{b}$ when the distance between the point$(1, -3)$ and the line $3x - \boldsymbol{b}y = 5$ is$(zero)$

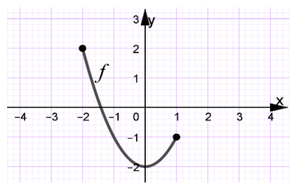
A. $\frac{3}{2}$ **B.** $\frac{-3}{2}$ **C.** $\frac{2}{3}$ **D.** $\frac{-2}{3}$

7. Find the value of $\boldsymbol{k}$ such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-\boldsymbol{k}}{x}$. **A.** $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

8. Determine the range of the function f from the given graph on the right .

A.$[-2, 2]$ **B**. $[-2, 1]$

C.$[-1, 2]$ **D**. $[0, 2]$



9. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

10. Find the equation of the line that passes through the point $(-4, 1)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

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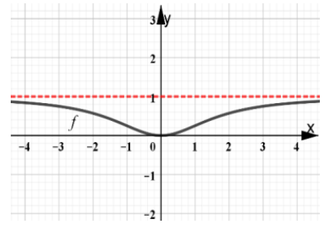
11. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .

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

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



12. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

13. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

14. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

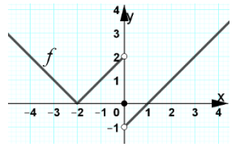
A. $x^2 - 2x$ **B.** $x^2 + 2x$ **C.** $x^2 + 2x + 4$ **D.** $x^2 - 2x + 4$

15. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

16. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$

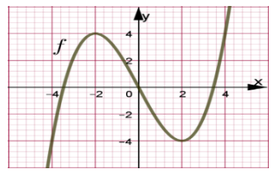
A. 0 **B.** -1 **C.** 2 **D.** Does not exist.



17. The given graph on the right shows the curve of the function f On which interval is f' increasing ?

A. $]-\infty, 0[$ **B.** $]0, +\infty[$

C. $]-\infty, 0[\cup]0, +\infty[$ **D.** $]-\infty, +\infty[$



18. Find the equation of a line passing through the points $(-2, -4)$ and $(-2, 4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

19. Find the result of $\lim_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

20. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty, 0[$ **B.** $]-\infty, 4[$ **C.** $]0, +\infty[$ **D.** None

21. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D .** $(-1, 2)$

22. Which of the following functions has a removable discontinuity at $x = -3$?

A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

23. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

24. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2, \sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

25. For what value of $\boldsymbol{a}$, does the function $f(x) = \begin{cases} \boldsymbol{a}x^2 + 1 & x \le 2 \\ 2x - \boldsymbol{a} & x > 2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

26. If f *and* g are two differentiable function for all x , and so are their derivatives.
Which of the following is true ?

A. $(f\,g' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (f\,g)''$

C. $(f'g')' = f''g''$ D. $(f\,g)'' = f\,g'' + 2f'g' + f''g$

27. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

28. The result of $\lim\limits_{\Delta x\to 0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

29. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

30. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D** $f(x) = \frac{x^2+x-6}{2x^2-8}$

31. The function $f(x) = \frac{-1}{x+2}$ is always ..... in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

32. Use the given graph of the function $y = f(x)$ on the right ,
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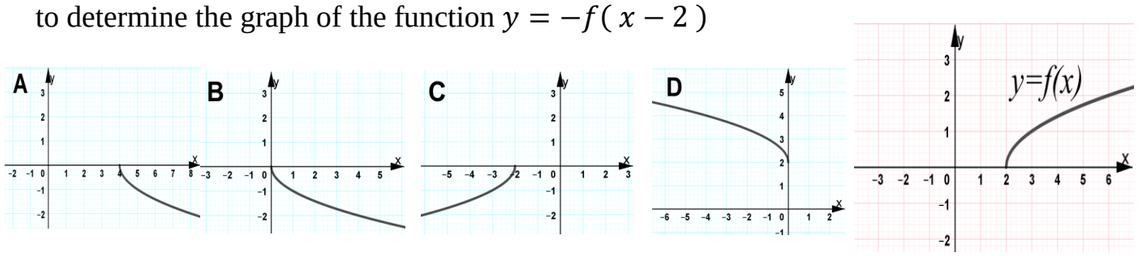


33. Find the result of $\lim\limits_{x\to-\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

34. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

35. The result of $\lim\limits_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

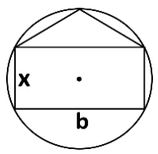
36. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A. $]-1\,,1\,[$ **B.** $]-\infty\,,-1[$ **C.** $]-1\,,+\infty[$ **D.** *None*

37. Which of the following is true ?

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

38. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

39. The result of $\lim\limits_{x\to-1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

40. Find the result of $\lim\limits_{x\to+\infty} \frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

41. Assume that x and y are two differentiable of a variable t . If $y = x^3 + 1$.
Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

42. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

43. The volume of a cube increases an average of $(36\ cm^3/min)$, while its surface area increases $(18\ cm^2/min)$, what is the length of the side of the cube ?

A. 2 cm **B.** 4 cm **C.** $2\sqrt{2}$ cm **D.** 8 cm

44. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

45. Depending on the intermediate value theorem (IVT). If the function f is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are .....

A. Positive **B.** Negative **C.** Opposite **D.** None

46. In a fireworks festival, a rocket is launched upward .The function $S(t) = -16t^2 + 192\,t + 4$ is the position function of the rocket, **t** is measured in seconds and **S** in feet
What is the highest point the rocket can reach ?

A. 404 ft **B.** 580 ft **C.** 606 ft **D.** 768 ft

47. The result of $\lim\limits_{x\to-2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

48. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

49. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

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50. Find the result of $\lim\limits_{x\to 0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

Kurdistan Region – Iraq SN: 30000013 In the Name of Allah Name: _____

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

General exams for preparatory stage (science) For the Academic year (2020-2021) First attemp

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71054

Choose the correct option, two marks for each right answer

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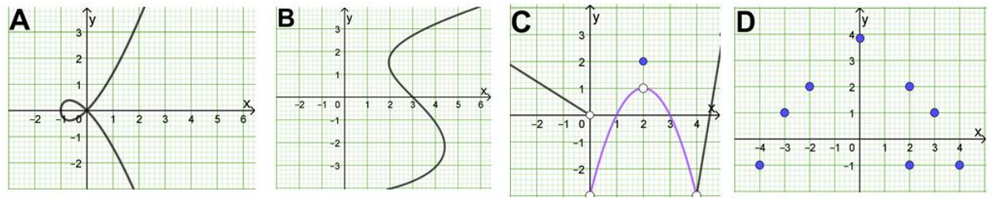

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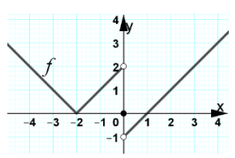
A. 0 **B.** -1 **C.** 2 **D.** Does not exist.



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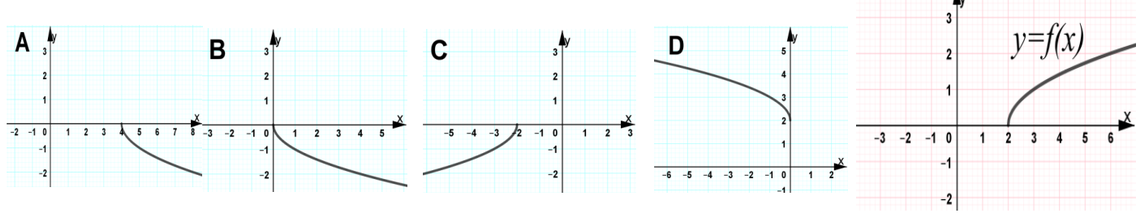

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A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

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A. Positive **B.** Negative **C.** Opposite **D.** None

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A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

32. The line $y = -4x + 7$ passes through which of the following points ?

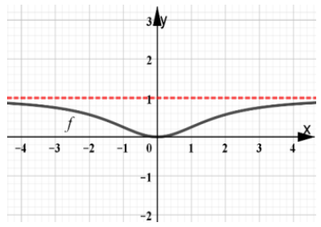
A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D.** $(-1, 2)$

33. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

34. The result of $\lim_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

35. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



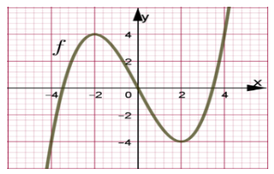
A. $f(x) = \frac{x^2}{x^2+3}$ **B.** $f(x) = \frac{x}{x^2+3}$

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

36. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

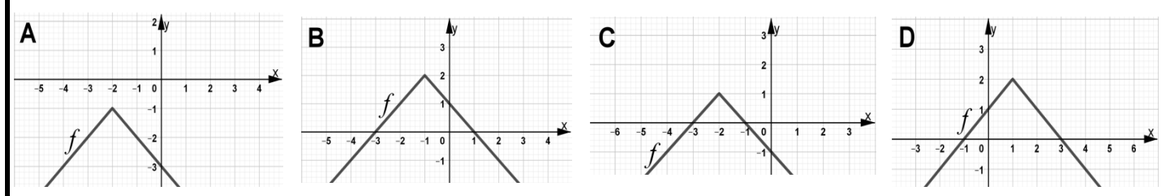
37. The given graph on the right shows the curve of the function f On which interval is f' increasing ?



A. $]-\infty, 0[$ **B.** $]0, +\infty[$

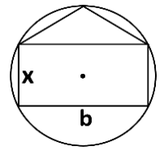
C. $]-\infty, 0[\cup]0, +\infty[$ **D.** $]-\infty, +\infty[$

38. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.



39. The result of $\lim_{x\to -2} \frac{\frac{1}{1-x}-\frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

40. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

41. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

42. Find the result of $\lim_{x\to 0} \frac{\frac{5}{2x+10}-\frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

43. Find the value of $\boldsymbol{b}$ when the distance between the point $(1, -3)$ and the line $3x - \boldsymbol{b}y = 5$ is$(zero)$

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

44. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

45. Find the value of $\boldsymbol{k}$ such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-\boldsymbol{k}}{\boldsymbol{x}}$. **A.** $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

46. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

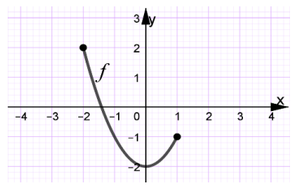
D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

47. Find the equation of the line that passes through the point $(-4, 1)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

48. Find the equation of a line passing through the points $(-2, -4)$ and $(-2, 4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

49. Determine the range of the function f from the given graph on the right .



A.$[-2, 2]$ **B**. $[-2, 1]$

C.$[-1, 2]$ **D**. $[0, 2]$

50. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

Kurdistan Region – Iraq SN: 30000014 **In the Name of Allah** **Name:** _____

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

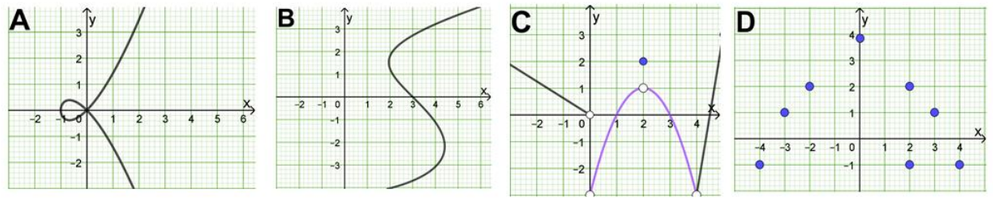
General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

Choose the correct option, two marks for each right answer

1. Find the third derivative of the function $f(x)=\frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x)=\frac{-24}{x^4}$ **B.** $f'''(x)=\frac{24}{x^4}$ **C.** $f'''(x)=\frac{-96}{x^5}$ **D.** $f'''(x)=\frac{96}{x^5}$

2. Which of the following graphs represents a function ?



3. Depending on the intermediate value theorem (IVT). If the function ***f*** is continuous between ($x=a$ and $x=b$) , then the equation $f(x)=0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

4. Find the result of $\lim_{x\to 0}\frac{\frac{5}{2x+10}-\frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

5. The result of $\lim_{x\to 3^-}\frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

6. Which of the following functions has a removable discontinuity at $x=-3$?

A. $f(x)=\frac{x^2-9}{(x+3)^2}$ **B.** $f(x)=\frac{x^3+27}{2x+6}$ **C.** $f(x)=\frac{x^2+9}{x+3}$ **D.** $f(x)=\frac{|x+3|}{2x+6}$

7. The result of $\lim_{x\to -1}\frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

8. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x)=g'(x)$, then $f(x)=g(x)$

C. If $g(x)=-5f(x)$, then $g'(x)=-5f'(x)$

D. If $y=\frac{2x}{\pi}$, then $\frac{dy}{dx}=\frac{2}{\pi}$

9. Redefine the function $f(x)=\frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x=1$.

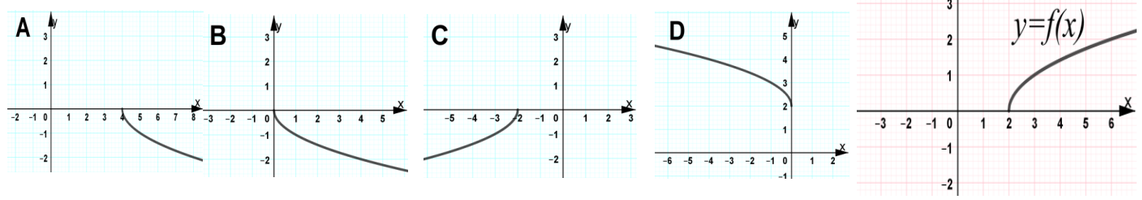
A. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ 1 & x=1\end{cases}$ **B.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ \sqrt{2} & x=1\end{cases}$

C. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ 0 & x=1\end{cases}$ **D.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ -1 & x=1\end{cases}$

10. Find the result of $\lim_{x\to+\infty}\frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

11. The result of $\lim_{x\to -2}\frac{\frac{1}{1-x}-\frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

12. Use the given graph of the function $y=f(x)$ on the right , to determine the graph of the function $y=-f(x-2)$

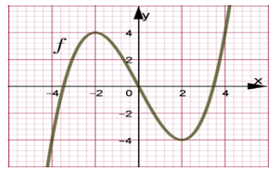


13. On which interval is the function $f(x)=\frac{x-1}{x+1}$ convex ?

A.$]-1,1[$ **B.** $]-\infty,-1[$ **C.**$]-1,+\infty[$ **D.** *None*

14. The result of $\lim_{x\to 0}\frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.**-1 **C.**-2 **D.** Does not exist.

15. The given graph on the right shows the curve of the function f On which interval is f' increasing ?



A. $]-\infty,0[$ **B.** $]0,+\infty[$

C. $]-\infty,0[\cup]0,+\infty[$ **D.** $]-\infty,+\infty[$

16. On which interval is the function $f(x)=x^{\frac{2}{3}}-4$ decreasing ?

A. $]-\infty,0[$ **B.** $]-\infty,4[$ **C.** $]0,+\infty[$ **D.** None

17. Which of the following functions has no vertical asymptote at $x=2$?

A. $f(x)=\frac{x^2-4}{(x-2)^2}$ **B.** $f(x)=\frac{x+2}{x^2-4}$ **C.** $f(x)=\frac{x^2+4}{x^2-3x+2}$ **D** .$f(x)=\frac{x^2+x-6}{2x^2-8}$

18. Find the result of $\lim_{x\to 0}\frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D** . $\frac{1}{2\sqrt{5}}$

19. If $f(x)=x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

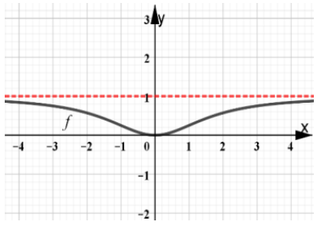
20. If $x^2-xy+y^2=1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.**$\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

21.IF $f(x)=3ax^3+3$ is a function and $f'(3)=-162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

22. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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

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

23. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y-x^2+3y=0$ **B.** $y=\sqrt{x-4}$ **C.**$y=|x+2|-2$ **D.** $x^2y-x=0$

24. If $f(x)=2x-4$ *and* $g(x)=1+3x$, find the value of x when $f(x)=g(x)$.

A. $x=-1$ **B.** $x=1$ **C.** $x=5$ **D.** $x=-5$

25. Find the domain of the function $g\circ f$ when $f(x)=4-x^2$ and $g(x)=-\sqrt{x}$.

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

26. Assume that x and y are two differentiable of a variable t. If $y = x^3 + 1$.
Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

27. If f and g are two differentiable function for all x, and so are their derivatives.
Which of the following is true ?

A. $(f\,g' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (f\,g)''$
C. $(f'g')' = f''g''$ D. $(f\,g)'' = f\,g'' + 2f'g' + f''g$

28. Find the value of b when the distance between the point $(1, -3)$ and the line $3x - by = 5$ is $(zero)$

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

29. The function $f(x) = \frac{-1}{x+2}$ is always ..... in its domain .

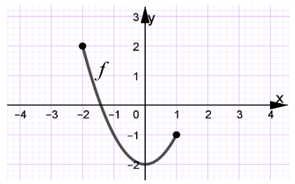
A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

30. Find the value of k such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-k}{x}$. **A.** $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

31. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

32. Find the result of $\lim_{x\to-\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

33. Determine the range of the function f from the given graph on the right .



A.$[-2, 2]$ **B.** $[-2, 1]$
C.$[-1, 2]$ **D.** $[0, 2]$

34. The result of $\lim_{\Delta x\to 0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.**$6x$ **B.**$-6x$ **C.**$3x^2$ **D.** $-3x^2$

35. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

36. Which of the following is true ?

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

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

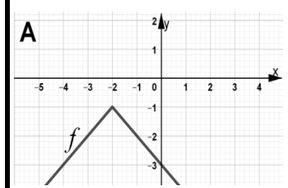
A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

38. The volume of a cube increases an average of $(36\ cm^3/min)$, while its surface area increases $(18\ cm^2/min)$, what is the length of the side of the cube ?

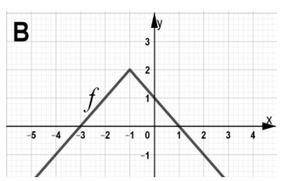
A. 2 cm **B.** 4 cm **C.** $2\sqrt{2}$ cm **D.** 8 cm

39. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.

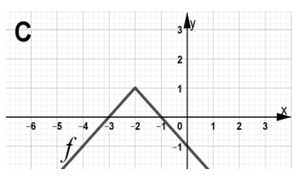
A



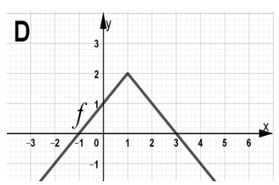
B



C



D



40. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

41. Find the equation of the line that passes through the point $(-4, 1)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

42. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. 256 m , 200 m **B.** 400 m , 128 m **C.** 512 m , 100 m **D.** 320 m , 160 m

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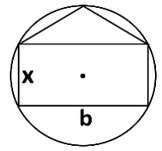


A.$\frac{3}{5}$ **B.**$\frac{2}{5}$ **C.**1 **D.** 2

44. In a fireworks festival, a rocket is launched upward .The function $S(t) = -16t^2 + 192\,t + 4$ is the position function of the rocket, **t** is measured in seconds and **S** in feet
What is the highest point the rocket can reach ?

A. 404 ft **B.** 580 ft **C.** 606 ft **D.** 768 ft

45. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.**$f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

46. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A.$f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

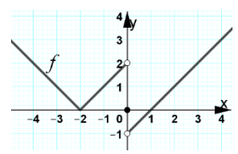
47. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D .** $(-1, 2)$

48. Find the equation of a line passing through the points $(-2, -4)$ and $(-2, 4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

49. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$



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

50. For what value of a , does the function $f(x) = \begin{cases} ax^2 + 1 & x \le 2 \\ 2x - a & x > 2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

Kurdistan Region – Iraq SN: 30000015 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

Choose the correct option, two marks for each right answer

1. Find the value of $\boldsymbol{b}$ when the distance between the point $(1,-3)$ and the line $3x-\boldsymbol{b}y=5$ is$(zero)$

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

2. Find the derivative of the function $f(x)=x\,e^{x}$.

A. $f'(x)=e^{x}$ **B.** $f'(x)=e^{x}(x+1)$ **C.** $f'(x)=e^{x}+1$ **D.** $f'(x)=xe^{x}+1$

3. If $x^2-xy+y^2=1$ then which of the following is equal to $\frac{dy}{dx}$?

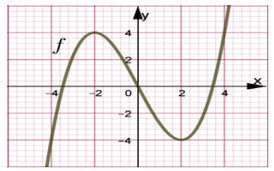
A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

4. The result of $\lim_{\Delta x\to 0}\frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

5. Find the equation of a line passing through the points $(-2,-4)$ and $(-2,4)$.

A. $x=-2$ **B.** $y=-2$ **C.** $y=-4$ **D.** $y=-2x-8$

6. The given graph on the right shows the curve of the function f
On which interval is f' increasing ?



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

7. Find the third derivative of the function $f(x)=\frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x)=\frac{-24}{x^4}$ **B.** $f'''(x)=\frac{24}{x^4}$ **C.** $f'''(x)=\frac{-96}{x^5}$ **D.** $f'''(x)=\frac{96}{x^5}$

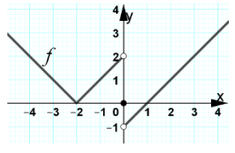
8. Determine the equation of the horizontal asymptote of the function $f(x)=\frac{2x-3x^2+1}{2x^2+5x}$.

A. $y=1$ **B.** $y=\frac{-3}{2}$ **C.** $y=\frac{-3}{5}$ **D.** $y=0$

9. Depending on the intermediate value theorem (IVT). If the function $\boldsymbol{f}$ is continuous between $(x=a$ and $x=b)$, then the equation $f(x)=0$ has at least one root between two numbers **a** and **b** when the signs $f(a)\ and\ f(b)$ are ……

A. Positive **B.** Negative **C.** Opposite **D.** None

10. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$



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

11. If $f\ and\ g$ are two differentiable function for all x , and so are their derivatives.
Which of the following is true ?

A. $(f\,g'-f'g)'=f'g''-f''g'$ B. $fg''+f''g=(f\,g)''$

C. $(f'g')'=f''g''$ D. $(f\,g)''=f\,g''+2f'g'+f''g$

12. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y-x^2+3y=0$ **B.** $y=\sqrt{x-4}$ **C.** $y=|x+2|-2$ **D.** $x^2y-x=0$

13. If $f(x)=2x-4\ \ and\ \ g(x)=1+3x$, find the value of x when $f(x)=g(x)$.

A. $x=-1$ **B.** $x=1$ **C.** $x=5$ **D.** $x=-5$

14. Assume that x and y are two differentiable of a variable t . If $y=x^3+1$.
Find $\frac{dx}{dt}$ at $x=2$, by knowing that $\frac{dy}{dt}=-3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D.** $\frac{-1}{2}$

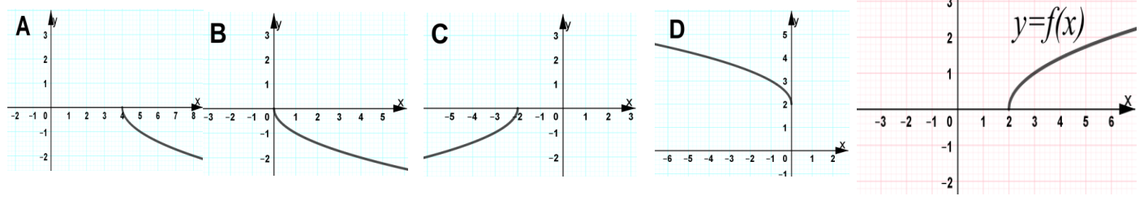
15. Find the domain of the function $g\circ f$ when $f(x)=4-x^2$ and $g(x)=-\sqrt{x}$.

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

16. The result of $\lim_{x\to 0}\frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

17. Find the result of $\lim_{x\to-\infty}\frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

18. Use the given graph of the function $y=f(x)$ on the right ,
to determine the graph of the function $y=-f(x-2)$



19. Find the value of $\boldsymbol{k}$ such that the line $y=\frac{3}{4}x+3$ is tangent to the graph of the function $f(x)=\frac{-\boldsymbol{k}}{\boldsymbol{x}}$. **A.** $k=2$ **B.** $k=-2$ **C.** $k=3$ **D.** $k=-3$

20. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t)=-16t^2+192\,t+4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet
What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

21. Redefine the function $f(x)=\frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x=1$.

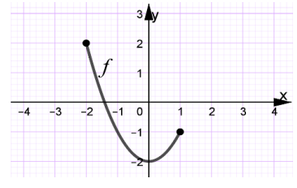
A. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ 1 & x=1\end{cases}$ **B.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ \sqrt{2} & x=1\end{cases}$

C. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ 0 & x=1\end{cases}$ **D.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ -1 & x=1\end{cases}$

22. Which of the following functions has a vertical asymptote at $x=3$ and slant asymptote at $y=-2x$?

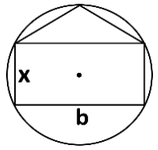
A. $f(x)=\frac{2x}{3-x}$ **B.** $f(x)=\frac{-2x^2+6x+1}{x-3}$ **C.** $f(x)=\frac{-4x^2-18x}{2x-6}$ **D.** $f(x)=\frac{-x^2+12x}{x-3}$

23. Determine the range of the function f from the given graph on the right .



A.$[-2,2]$ **B.** $[-2,1]$
C.$[-1,2]$ **D.** $[0,2]$

24. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

25. Find the result of $\lim_{x\to+\infty} \frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

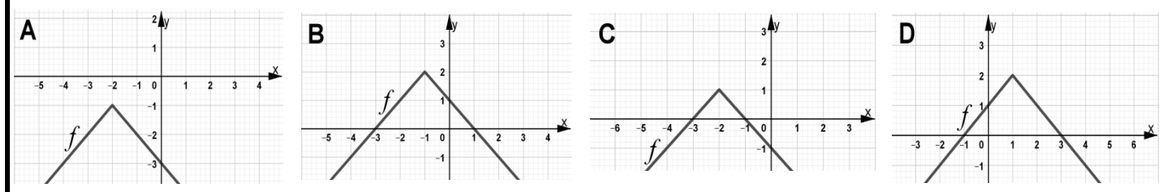
26. The result of $\lim_{x\to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

27. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

28. Which of the following is true ?

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

29. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.



30. The result of $\lim_{x\to-1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

31. The result of $\lim_{x\to-2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

32. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. 2 cm **B.** 4 cm **C.** $2\sqrt{2}$ cm **D.** 8 cm

33. For what value of $\boldsymbol{a}$, does the function $f(x) = \begin{cases} \boldsymbol{a}x^2 + 1 & x \le 2 \\ 2x - \boldsymbol{a} & x > 2 \end{cases}$ has no points of discontinuity?

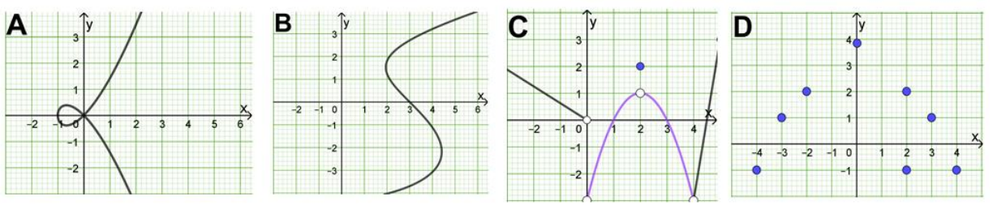
A. $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

34. Find the result of $\lim_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

35. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1\,,0)$ **B.** $(2\,,0)$ **C.** $(0\,,0)$ **D.** None

36. Which of the following graphs represents a function ?



37. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty\,,0\,[$ **B.** $]-\infty\,,4\,[$ **C.** $]0\,,+\infty[$ **D.** None

38. The function $f(x) = \frac{-1}{x+2}$ is always ..... in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

39. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .** $f(x) = \frac{x^2+x-6}{2x^2-8}$

40. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2\,,\sqrt{3}\,)$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

41. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. 256 m , 200 m **B.** 400 m , 128 m **C.** 512 m , 100 m **D.** 320 m , 160 m

42. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

43. Find the equation of the line that passes through the point $(-4\,,1\,)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

44. Find the result of $\lim_{x\to 0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

45. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A. $]-1\,,1\,[$ **B.** $]-\infty\,,-1[$ **C.** $]-1\,,+\infty[$ **D.** *None*

46. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

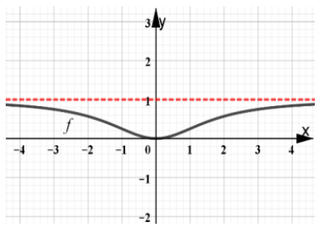
C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

47. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5\,,-3\,)$ **B.** $(-3\,,5\,)$ **C.** $(2\,,-1\,)$ **D .** $(-1\,,2\,)$

48. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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

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

49. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

50. Which of the following functions has a removable discontinuity at $x = -3$?

A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

Kurdistan Region – Iraq SN: 30000016 In the Name of Allah Name: _____

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

General exams for preparatory stage (science) For the Academic year (2020-2021) First attemp 71054

Choose the correct option, two marks for each right answer

1. On which interval is the function $f(x)=\frac{x-1}{x+1}$ convex ?

A. $]-1,1[$ **B.** $]-\infty,-1[$ **C.** $]-1,+\infty[$ **D.** *None*

2. Find the point of inflection for the function $f(x)=3x(x-1)(x-2)$.

A. $(1,0)$ **B.** $(2,0)$ **C.** $(0,0)$ **D.** None

3. The line $y=-4x+7$ passes through which of the following points ?

A. $(5,-3)$ **B.** $(-3,5)$ **C.** $(2,-1)$ **D .** $(-1,2)$

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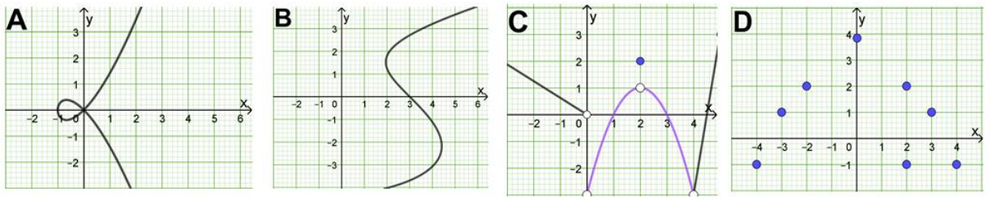


5. Find the slope of the tangent line to the graph $y^2=\frac{x+1}{x-1}$ at the point $(2,\sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

6. If $f(x)=2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

7. Find the value of $\boldsymbol{b}$ when the distance between the point $(1,-3)$ and the line $3x-\boldsymbol{b}y=5$ is$(zero)$

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

8. If $f(x)=2x-4$ *and* $g(x)=1+3x$, find the value of x when $f(x)=g(x)$.

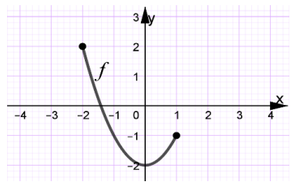
A. $x=-1$ **B.** $x=1$ **C.** $x=5$ **D.** $x=-5$

9. Find the result of $\lim_{x\to0}\frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

10. Determine the range of the function f from the given graph on the right .

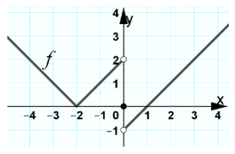
A.$[-2,2]$ **B.** $[-2,1]$

C.$[-1,2]$ **D.** $[0,2]$



11. Use the given graph on the right to find the result of $\lim_{x\to0^+}f(x)$

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



12. Find the result of $\lim_{x\to-\infty}\frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

13. Redefine the function $f(x)=\frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x=1$.

A. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ 1 & x=1\end{cases}$ **B.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ \sqrt{2} & x=1\end{cases}$

C. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ 0 & x=1\end{cases}$ **D.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ -1 & x=1\end{cases}$

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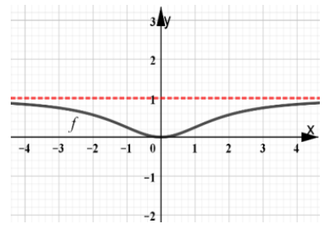

15. The result of $\lim_{\Delta x\to0}\frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

16. If $x^2-xy+y^2=1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

17. Find the derivative of the function $f(x)=x\,e^x$.

A. $f'(x)=e^x$ **B.** $f'(x)=e^x(x+1)$ **C.** $f'(x)=e^x+1$ **D.** $f'(x)=xe^x+1$

18. Find the result of $\lim_{x\to+\infty}\frac{ln\,x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

19. Which of the following is true ?

A. $\lim_{x\to+\infty}(2+\frac{sinx}{x})=2$ **B.** $\lim_{x\to2}\frac{3}{x-2}=3$ **C.** $\lim_{x\to1}\frac{x^2-1}{x-1}=0$ **D.** $\lim_{x\to0}\frac{sinx}{x}=0$

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21. The function $f(x)=\frac{-1}{x+2}$ is always ……. in its domain .

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22. The result of $\lim_{x\to3^-}\frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

23. Find the result of $\lim_{x\to0}\frac{\frac{5}{2x+10}-\frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

24. Find the equation of the line that passes through the point $(-4,1)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

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

29. Depending on the intermediate value theorem (IVT). If the function ***f*** is continuous between ($x=a$ and $x=b$) , then the equation $f(x)=0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

30. On which interval is the function $f(x)=x^{\frac{2}{3}}-4$ decreasing ?

A. $]-\infty,0[$ **B.** $]-\infty,4[$ **C.** $]0,+\infty[$ **D.** None

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A. $y=1$ **B.** $y=\frac{-3}{2}$ **C.** $y=\frac{-3}{5}$ **D.** $y=0$

32. Find the value of ***k*** such that the line $y=\frac{3}{4}x+3$ is tangent to the graph of the function $f(x)=\frac{-k}{x}$.

A. $k=2$ **B.** $k=-2$ **C.** $k=3$ **D.** $k=-3$

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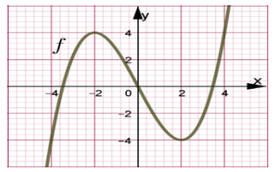
On which interval is f' increasing ?



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

34. Use the given graph of the function $y=f(x)$ on the right ,
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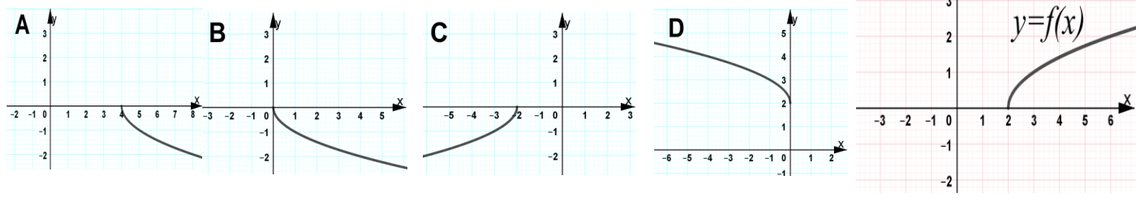

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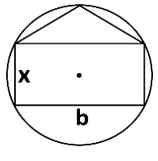


A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

36. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

37. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y-x^2+3y=0$ **B.** $y=\sqrt{x-4}$ **C.** $y=|x+2|-2$ **D.** $x^2y-x=0$

38. Which of the following functions has a vertical asymptote at $x=3$ and slant asymptote at $y=-2x$?

A. $f(x)=\frac{2x}{3-x}$ **B.** $f(x)=\frac{-2x^2+6x+1}{x-3}$ **C.** $f(x)=\frac{-4x^2-18x}{2x-6}$ **D.** $f(x)=\frac{-x^2+12x}{x-3}$

39. Assume that ***x*** and ***y*** are two differentiable of a variable ***t*** . If $y=x^3+1$.
Find $\frac{dx}{dt}$ at $x=2$, by knowing that $\frac{dy}{dt}=-3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

40. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

41. If f *and* g are two differentiable function for all x , and so are their derivatives.
Which of the following is true ?

A. $(fg'-f'g)'=f'g''-f''g'$ B. $fg''+f''g=(fg)''$
C. $(f'g')'=f''g''$ D. $(fg)''=fg''+2f'g'+f''g$

42. The result of $\lim_{x\to -1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

43. For what value of ***a*** , does the function $f(x)=\begin{cases} ax^2+1 & x\le 2 \\ 2x-a & x>2 \end{cases}$ has no points of discontinuity?

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

44. The result of $\lim_{x\to -2} \frac{\frac{1}{1-x}-\frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

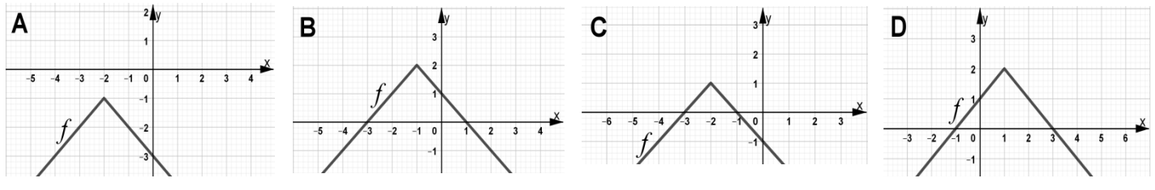
45. IF $f(x)=3ax^3+3$ is a function and $f'(3)=-162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

46. Which of the following functions has a removable discontinuity at $x=-3$?

A. $f(x)=\frac{x^2-9}{(x+3)^2}$ **B.** $f(x)=\frac{x^3+27}{2x+6}$ **C.** $f(x)=\frac{x^2+9}{x+3}$ **D.** $f(x)=\frac{|x+3|}{2x+6}$

47. Determine the graph of the function $f(x)=2-|x+1|$ by using point plotting.



48. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t)=-16t^2+192\,t+4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet
What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

49. Find the equation of a line passing through the points $(-2,-4)$ and $(-2,4)$.

A. $x=-2$ **B.** $y=-2$ **C.** $y=-4$ **D.** $y=-2x-8$

50. Which of the following functions has no vertical asymptote at $x=2$?

A. $f(x)=\frac{x^2-4}{(x-2)^2}$ **B.** $f(x)=\frac{x+2}{x^2-4}$ **C.** $f(x)=\frac{x^2+4}{x^2-3x+2}$ **D .** $f(x)=\frac{x^2+x-6}{2x^2-8}$

Kurdistan Region – Iraq SN: 30000017 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp**

71 54

Choose the correct option, two marks for each right answer

1. Find the value of $\boldsymbol{b}$ when the distance between the point $(1,-3)$ and the line $3x-\boldsymbol{b}y=5$ is $(zero)$

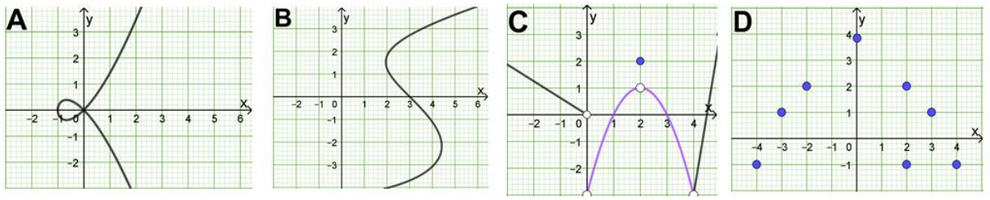
A. $\frac{3}{2}$ **B.** $\frac{-3}{2}$ **C.** $\frac{2}{3}$ **D.** $\frac{-2}{3}$

2. Assume that $\boldsymbol{x}$ and $\boldsymbol{y}$ are two differentiable of a variable $\boldsymbol{t}$. If $y=x^3+1$.

Find $\frac{dx}{dt}$ at $x=2$, by knowing that $\frac{dy}{dt}=-3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

3. Which of the following graphs represents a function ?



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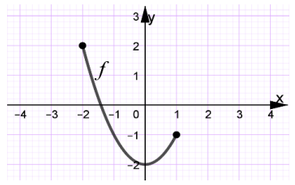
A. $f(x)=\frac{2x}{3-x}$ **B.** $f(x)=\frac{-2x^2+6x+1}{x-3}$ **C.** $f(x)=\frac{-4x^2-18x}{2x-6}$ **D.** $f(x)=\frac{-x^2+12x}{x-3}$

5. Determine the range of the function f from the given graph on the right .

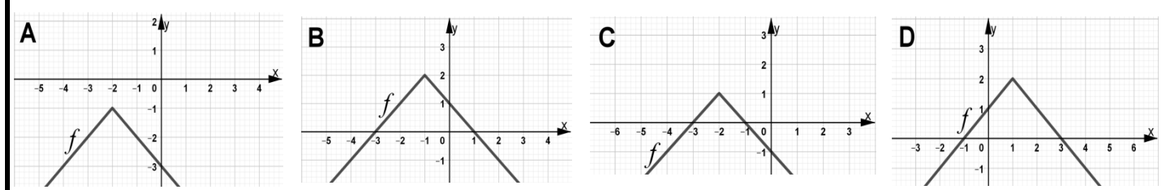
A.$[-2,2]$ **B.** $[-2,1]$

C.$[-1,2]$ **D.** $[0,2]$



6. The result of $\lim_{x\to-1}\frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.**-4 **C.** 4 **D.** $\frac{4}{5}$

7. Determine the graph of the function $f(x)=2-|x+1|$ by using point plotting.



8. Find the result of $\lim_{x\to-\infty}\frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

9. Which of the following functions has a removable discontinuity at $x=-3$?

A. $f(x)=\frac{x^2-9}{(x+3)^2}$ **B.** $f(x)=\frac{x^3+27}{2x+6}$ **C.** $f(x)=\frac{x^2+9}{x+3}$ **D.** $f(x)=\frac{|x+3|}{2x+6}$

10. The result of $\lim_{x\to3^-}\frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

11. Find the result of $\lim_{x\to+\infty}\frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

12. Redefine the function $f(x)=\frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x=1$.

A. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ 1 & x=1\end{cases}$ **B.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ \sqrt{2} & x=1\end{cases}$

C. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ 0 & x=1\end{cases}$ **D.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ -1 & x=1\end{cases}$

13.A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

14. Find the equation of the line that passes through the point $(-4,1)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

15. Find the third derivative of the function $f(x)=\frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x)=\frac{-24}{x^4}$ **B.**$f'''(x)=\frac{24}{x^4}$ **C.** $f'''(x)=\frac{-96}{x^5}$ **D.** $f'''(x)=\frac{96}{x^5}$

16. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t)=-16t^2+192\,t+4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

17. If $f(x)=x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

18. Find the slope of the tangent line to the graph $y^2=\frac{x+1}{x-1}$ at the point $(2,\sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

19. On which interval is the function $f(x)=\frac{x-1}{x+1}$ convex ?

A.$]-1,1[$ **B.** $]-\infty,-1[$ **C.**$]-1,+\infty[$ **D.** $None$

20. Determine the equation of the horizontal asymptote of the function $f(x)=\frac{2x-3x^2+1}{2x^2+5x}$.

A. $y=1$ **B.** $y=\frac{-3}{2}$ **C.** $y=\frac{-3}{5}$ **D.** $y=0$

21. Find the result of $\lim_{x\to0}\frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

22. For what value of $\boldsymbol{a}$, does the function $f(x)=\begin{cases}\boldsymbol{a}x^2+1 & x\leq2\\ 2x-\boldsymbol{a} & x>2\end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

23. If $f(x)=2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

24. Find the equation of a line passing through the points $(-2,-4)$ and $(-2,4)$.

A. $x=-2$ **B.** $y=-2$ **C.** $y=-4$ **D.** $y=-2x-8$

25. Which of the following functions has no vertical asymptote at $x=2$?

A. $f(x)=\frac{x^2-4}{(x-2)^2}$ **B.** $f(x)=\frac{x+2}{x^2-4}$ **C.** $f(x)=\frac{x^2+4}{x^2-3x+2}$ **D .** $f(x)=\frac{x^2+x-6}{2x^2-8}$

26. The result of $\lim_{\Delta x\to0}\frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.**$6x$ **B.**$-6x$ **C.**$3x^2$ **D.** $-3x^2$

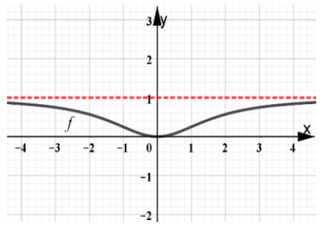
27. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

28. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

29. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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

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

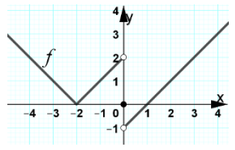
30. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D .** $(-1, 2)$

31. Depending on the intermediate value theorem (IVT). If the function ***f*** is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

32. Use the given graph on the right to find the result of $\lim\limits_{x\to 0^+} f(x)$



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

33. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

34. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

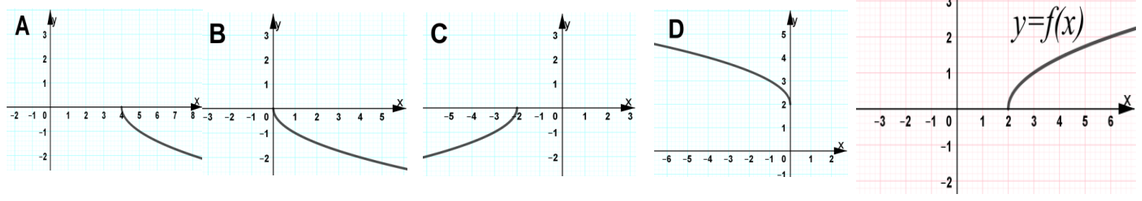
B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

35. The result of $\lim\limits_{x\to -2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

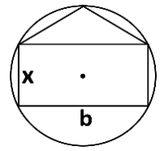
36. Use the given graph of the function $y = f(x)$ on the right , to determine the graph of the function $y = -f(x-2)$



37. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

38. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?

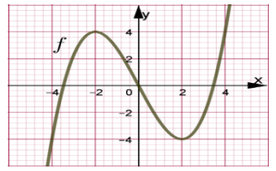


A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

39. The function $f(x) = \frac{-1}{x+2}$ is always ……. in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

40. The given graph on the right shows the curve of the function f On which interval is f' increasing ?



A. $]-\infty, 0[$ **B.** $]0, +\infty[$

C. $]-\infty, 0[\cup]0, +\infty[$ **D.** $]-\infty, +\infty[$

41. The result of $\lim\limits_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

42. If f *and* g are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

A. $(fg' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (fg)''$

C. $(f'g')' = f''g''$ D. $(fg)'' = fg'' + 2f'g' + f''g$

43. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. 2 cm **B.** 4 cm **C.** $2\sqrt{2}$ cm **D.** 8 cm

44. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

45. Find the value of ***k*** such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-k}{x}$.

A. $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

46. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty, 0[$ **B.** $]-\infty, 4[$ **C.** $]0, +\infty[$ **D.** None

47. Which of the following is true ?

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

48. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

49. Find the result of $\lim\limits_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

50. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

Kurdistan Region – Iraq SN: 30000018 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

Choose the correct option, two marks for each right answer

1. Find the equation of a line passing through the points $(-2,-4)$ and $(-2,4)$.

A. $x=-2$ **B.** $y=-2$ **C.** $y=-4$ **D.** $y=-2x-8$

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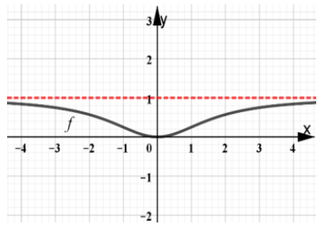

A. $f(x)=\frac{x^2}{x^2+3}$ **B.** $f(x)=\frac{x}{x^2+3}$

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

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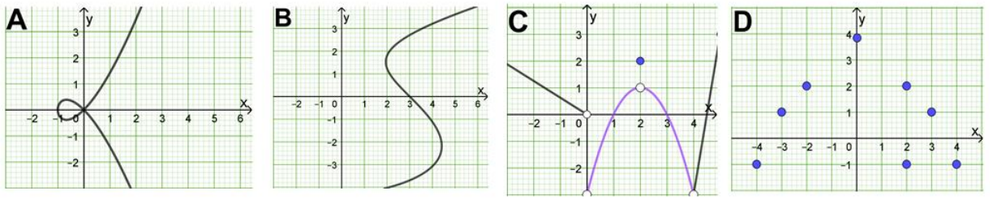

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A. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ 1 & x=1\end{cases}$ **B.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ \sqrt{2} & x=1\end{cases}$

C. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ 0 & x=1\end{cases}$ **D.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ -1 & x=1\end{cases}$

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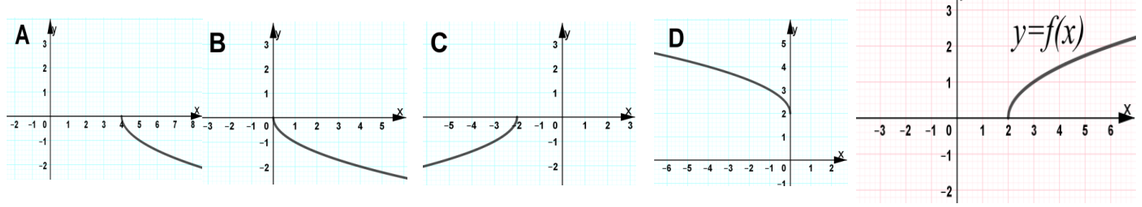
A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

6. Use the given graph of the function $y=f(x)$ on the right , to determine the graph of the function $y=-f(x-2)$



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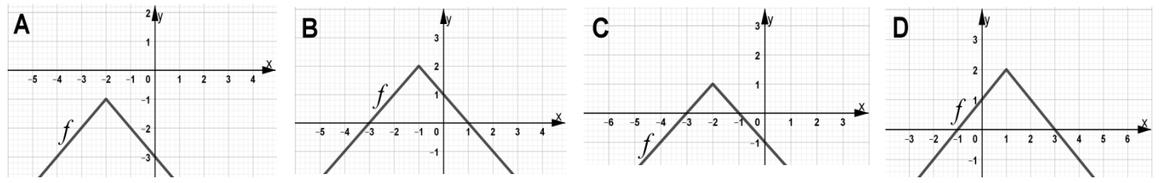
A. x^2-2x **B.** x^2+2x **C.** x^2+2x+4 **D.** x^2-2x+4

8. Determine the graph of the function $f(x)=2-|x+1|$ by using point plotting.



9. On which interval is the function $f(x)=x^{\frac{2}{3}}-4$ decreasing ?

A. $]-\infty,0[$ **B.** $]-\infty,4[$ **C.** $]0,+\infty[$ **D.** None

10. Which of the following functions has a removable discontinuity at $x=-3$?

A. $f(x)=\frac{x^2-9}{(x+3)^2}$ **B.** $f(x)=\frac{x^3+27}{2x+6}$ **C.** $f(x)=\frac{x^2+9}{x+3}$ **D.** $f(x)=\frac{|x+3|}{2x+6}$

11. Which of the following is true ?

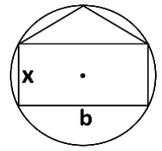
A. $\lim_{x\to+\infty}(2+\frac{sinx}{x})=2$ **B.** $\lim_{x\to 2}\frac{3}{x-2}=3$ **C.** $\lim_{x\to 1}\frac{x^2-1}{x-1}=0$ **D.** $\lim_{x\to 0}\frac{sinx}{x}=0$

12. Find the derivative of the function $f(x)=x\,e^x$.

A. $f'(x)=e^x$ **B.** $f'(x)=e^x(x+1)$ **C.** $f'(x)=e^x+1$ **D.** $f'(x)=xe^x+1$

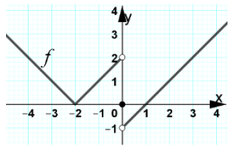
13. Find the value of k such that the line $y=\frac{3}{4}x+3$ is tangent to the graph of the function $f(x)=\frac{-k}{x}$. **A.** $k=2$ **B.** $k=-2$ **C.** $k=3$ **D.** $k=-3$

14. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



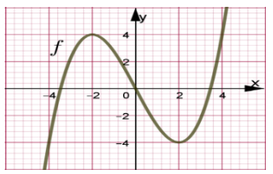
A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

15. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$



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

16. The given graph on the right shows the curve of the function f On which interval is f' increasing ?



A. $]-\infty,0[$ **B.** $]0,+\infty[$

C. $]-\infty,0[\cup]0,+\infty[$ **D.** $]-\infty,+\infty[$

17. The result of $\lim_{\Delta x\to 0}\frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

18. Find the third derivative of the function $f(x)=\frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x)=\frac{-24}{x^4}$ **B.** $f'''(x)=\frac{24}{x^4}$ **C.** $f'''(x)=\frac{-96}{x^5}$ **D.** $f'''(x)=\frac{96}{x^5}$

19. Find the equation of the line that passes through the point $(-4,1)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

20. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

21. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

22. Find the result of $\lim_{x\to+\infty} \frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

23. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D .** $(-1, 2)$

24. Depending on the intermediate value theorem (IVT). If the function ***f*** is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

25. Assume that x and y are two differentiable of a variable ***t*** . If $y = x^3 + 1$.

Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

26. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

27. Find the result of $\lim_{x\to-\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

28. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

29. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

30. The function $f(x) = \frac{-1}{x+2}$ is always ……. in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

31. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

32. For what value of a , does the function $f(x) = \begin{cases} ax^2 + 1 & x \le 2 \\ 2x - a & x > 2 \end{cases}$ has no points of discontinuity?

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

33. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

34. The result of $\lim_{x\to3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

35. The result of $\lim_{x\to0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

36. The result of $\lim_{x\to-2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

37. If f *and* g are two differentiable function for all x , and so are their derivatives.

Which of the following is true ?

A. $(fg' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (fg)''$

C. $(f'g')' = f''g''$ D. $(fg)'' = fg'' + 2f'g' + f''g$

38. The result of $\lim_{x\to-1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

39. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2, \sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

40. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

41. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

42. Find the value of ***b*** when the distance between the point $(1, -3)$ and the line $3x - by = 5$ is$(zero)$

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

43. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

44. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .** $f(x) = \frac{x^2+x-6}{2x^2-8}$

45. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t) = -16t^2 + 192\,t + 4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

46. Find the result of $\lim_{x\to0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

47. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A. $]-1, 1[$ **B.** $]-\infty, -1[$ **C.** $]-1, +\infty[$ **D.** $None$

48. Find the result of $\lim_{x\to0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

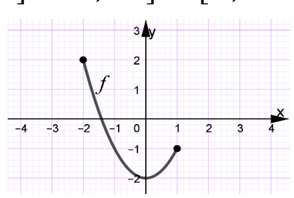
49. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

50. Determine the range of the function f from the given graph on the right .

A.$[-2, 2]$ **B.** $[-2, 1]$

C.$[-1, 2]$ **D.** $[0, 2]$



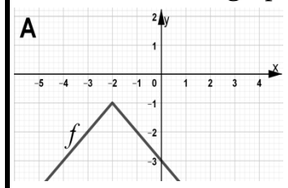
Kurdistan Region – Iraq SN: 30000019 **In the Name of Allah** **Name:** _____

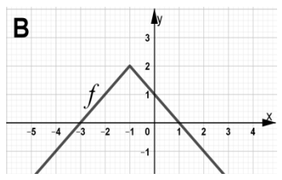
High Committee for General Examinations **Subject: Maths** **Time: 3:30 Hours** **S** 71054

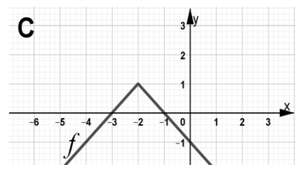
General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp**

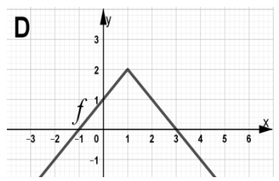
Choose the correct option, two marks for each right answer

1. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.

A 

B 

C 

D 

2. The result of $\lim\limits_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

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5. Find the value of b when the distance between the point $(1, -3)$ and the line $3x - by = 5$ is $(zero)$

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

6. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

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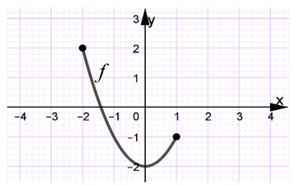

10. Which of the following is true ?

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

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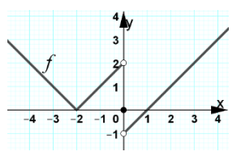

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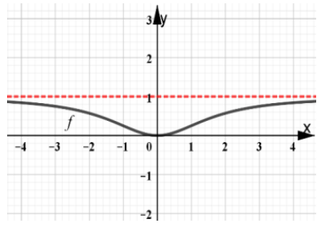
27. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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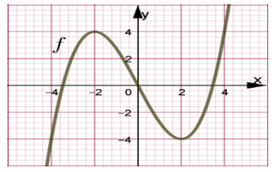

A. $]-\infty\ ,0[$ **B.** $]0\ ,+\infty[$

C. $]-\infty\ ,0[\cup]0\ ,+\infty[$ **D.** $]-\infty\ ,+\infty[$

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A. $]-1\ ,1\ [$ **B.** $]-\infty\ ,-1[$ **C.** $]-1\ ,+\infty[$ **D.** *None*

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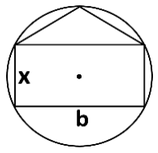


A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

39. If $f(x)=x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

40. The line $y=-4x+7$ passes through which of the following points ?

A. $(5\ ,-3\ )$ **B.** $(-3\ ,5\ )$ **C.** $(2\ ,-1\ )$ **D .** $(-1\ ,2\ )$

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

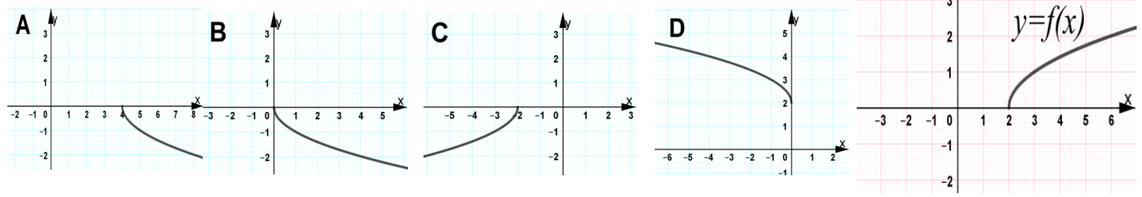
A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

42. Find the domain of the function $g\circ f$ when $f(x)=4-x^2$ and $g(x)=-\sqrt{x}$.

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

43. Use the given graph of the function $y=f(x)$ on the right ,

to determine the graph of the function $y=-f(x-2)$



44. IF $f(x)=3ax^3+3$ is a function and $f'(3)=-162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

45. Which of the following functions has no vertical asymptote at $x=2$?

A. $f(x)=\frac{x^2-4}{(x-2)^2}$ **B.** $f(x)=\frac{x+2}{x^2-4}$ **C.** $f(x)=\frac{x^2+4}{x^2-3x+2}$ **D .** $f(x)=\frac{x^2+x-6}{2x^2-8}$

46. Find the equation of a line passing through the points $(-2\ ,-4)$ and $(-2\ ,4\ )$.

A. $x=-2$ **B.** $y=-2$ **C.** $y=-4$ **D.** $y=-2x-8$

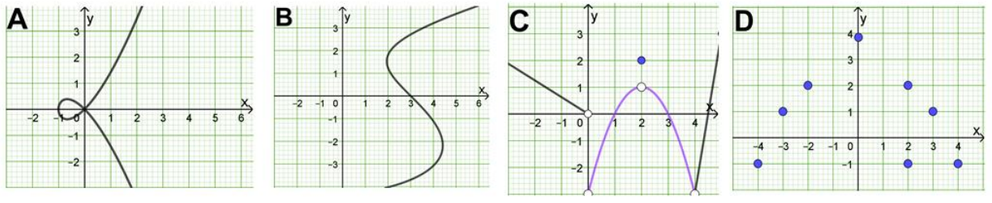
47. Redefine the function $f(x)=\frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x=1$.

A. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ 1 & x=1\end{cases}$ **B.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ \sqrt{2} & x=1\end{cases}$

C. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ 0 & x=1\end{cases}$ **D.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ -1 & x=1\end{cases}$

48. Find the equation of the line that passes through the point $(-4\ ,1\ )$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

49. Which of the following graphs represents a function ?



50. Find the result of $\lim\limits_{x\to-\infty}\frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

Kurdistan Region – Iraq SN: 30000020 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

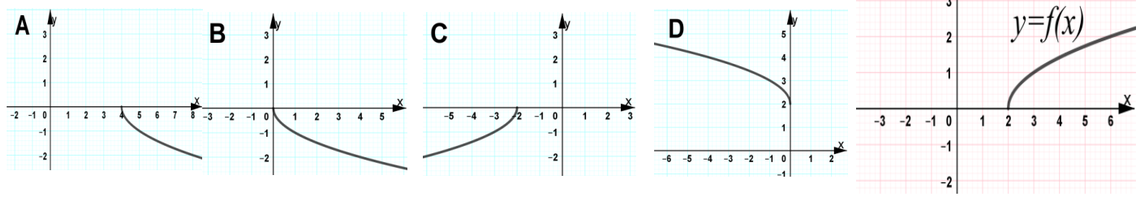
Choose the correct option, two marks for each right answer

1. For what value of a , does the function $f(x)=\begin{cases} ax^2+1 & x\le 2 \\ 2x-a & x>2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D.** $\frac{3}{5}$

2. On which interval is the function $f(x)=x^{\frac{2}{3}}-4$ decreasing ?

A. $]-\infty,0[$ **B.** $]-\infty,4[$ **C.** $]0,+\infty[$ **D.** None

3. Use the given graph of the function $y=f(x)$ on the right , to determine the graph of the function $y=-f(x-2)$



4. If f *and* g are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

A. $(fg'-f'g)'=f'g''-f''g'$ B. $fg''+f''g=(fg)''$

C. $(f'g')'=f''g''$ D. $(fg)''=fg''+2f'g'+f''g$

5. Find the point of inflection for the function $f(x)=3x(x-1)(x-2)$.

A. $(1,0)$ **B.** $(2,0)$ **C.** $(0,0)$ **D.** None

6. Find the result of $\lim\limits_{x\to+\infty}\frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

7. The volume of a cube increases an average of $(36\ cm^3/min)$, while its surface area increases $(18\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

8. Redefine the function $f(x)=\frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x=1$.

A. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ 1 & x=1\end{cases}$ **B.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ \sqrt{2} & x=1\end{cases}$

C. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ 0 & x=1\end{cases}$ **D.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq 1\\ -1 & x=1\end{cases}$

9. The result of $\lim\limits_{\Delta x\to 0}\frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

10. Find the slope of the tangent line to the graph $y^2=\frac{x+1}{x-1}$ at the point $(2,\sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

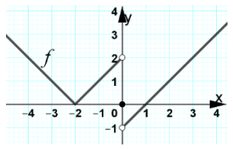
11. Find the result of $\lim\limits_{x\to-\infty}\frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

12. Find the equation of a line passing through the points $(-2,-4)$ and $(-2,4)$.

0020 **A.** $x=-2$ **B.** $y=-2$ **C.** $y=-4$ **D.** $y=-2x-8$

13. Use the given graph on the right to find the result of $\lim\limits_{x\to 0^+}f(x)$

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

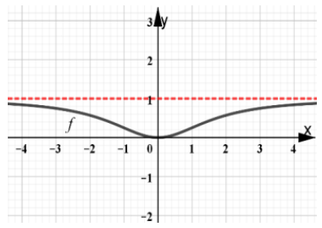


14. Find the result of $\lim\limits_{x\to 0}\frac{\frac{5}{2x+10}-\frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

15. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .

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

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



16. Find the domain of the function $g\circ f$ when $f(x)=4-x^2$ and $g(x)=-\sqrt{x}$.

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

17. Find the value of b when the distance between the point $(1,-3)$ and the line $3x-by=5$ is$(zero)$

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

18. Assume that x and y are two differentiable of a variable t . If $y=x^3+1$.

Find $\frac{dx}{dt}$ at $x=2$, by knowing that $\frac{dy}{dt}=-3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D.** $\frac{-1}{2}$

19. The result of $\lim\limits_{x\to 3^-}\frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

20. Find the equation of the line that passes through the point $(-4,1)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

21. On which interval is the function $f(x)=\frac{x-1}{x+1}$ convex ?

A. $]-1,1[$ **B.** $]-\infty,-1[$ **C.** $]-1,+\infty[$ **D.** *None*

22. Find the value of k such that the line $y=\frac{3}{4}x+3$ is tangent to the graph of the function $f(x)=\frac{-k}{x}$. **A.** $k=2$ **B.** $k=-2$ **C.** $k=3$ **D.** $k=-3$

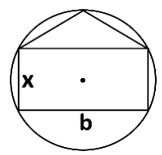
23. Determine the equation of the horizontal asymptote of the function $f(x)=\frac{2x-3x^2+1}{2x^2+5x}$.

A. $y=1$ **B.** $y=\frac{-3}{2}$ **C.** $y=\frac{-3}{5}$ **D.** $y=0$

24. Find the result of $\lim\limits_{x\to 0}\frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D.** $\frac{1}{2\sqrt{5}}$

25. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?

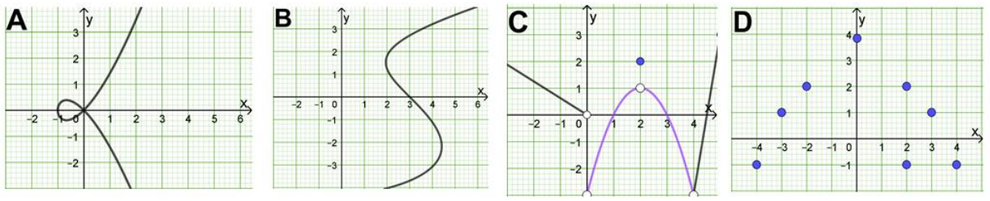
A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2



26. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m\ ,200\ m$ **B.** $400\ m\ ,128\ m$ **C.** $512\ m\ ,100\ m$ **D.** $320\ m\ ,160\ m$

27. Which of the following graphs represents a function ?



28. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

29. If $f(x) = 2\ (sinx)\ (cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

30. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

31. The result of $\lim\limits_{x\to -1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

32. Which of the following functions has a removable discontinuity at $x = -3$?

A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

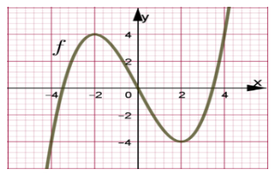
33. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

34. The result of $\lim\limits_{x\to -2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

35. The given graph on the right shows the curve of the function f

On which interval is f' increasing ?



A. $]-\infty\ ,0[$ **B.** $]0\ ,+\infty[$

C. $]-\infty\ ,0[\ \cup\ ]0\ ,+\infty[$ **D.** $]-\infty\ ,+\infty[$

36. Depending on the intermediate value theorem (IVT). If the function $\boldsymbol{f}$ is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)\ and\ f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

37. If $f(x) = 2x - 4\ \ and\ \ g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

38. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t) = -16t^2 + 192\,t + 4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

39. Which of the following is true ?

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

40. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

41. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5\ ,-3)$ **B.** $(-3\ ,5)$ **C.** $(2\ ,-1)$ **D .** $(-1\ ,2)$

42. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .** $f(x) = \frac{x^2+x-6}{2x^2-8}$

43. The result of $\lim\limits_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

44. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

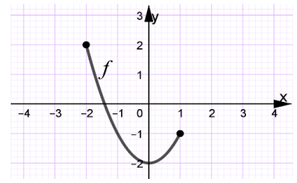
45. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

46. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

47. Determine the range of the function f from the given graph on the right .



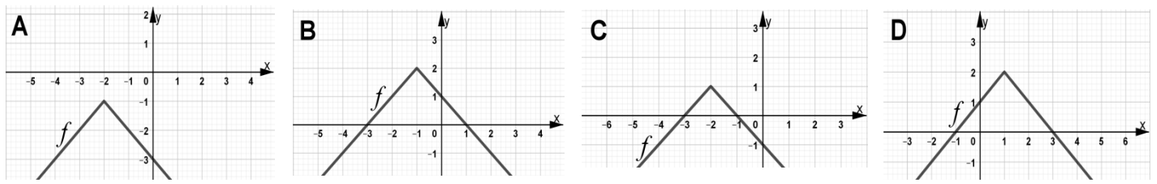
A.$[-2\ ,2]$ **B.** $[-2\ ,1]$

C.$[-1\ ,2]$ **D.** $[0\ ,2]$

48. The function $f(x) = \frac{-1}{x+2}$ is always ……. in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

49. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.



50. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

Kurdistan Region – Iraq SN: 30000021 In the Name of Allah Name: _____

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

General exams for preparatory stage (science) For the Academic year (2020-2021) First attemp

71054

Choose the correct option, two marks for each right answer

1. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D.** $(-1, 2)$

2. Find the derivative of the function $f(x) = x\,e^x$.

A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

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A. 2 **B.** -51 **C.** 51 **D.** -45

4. Find the equation of the line that passes through the point $(-4, 1)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

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6. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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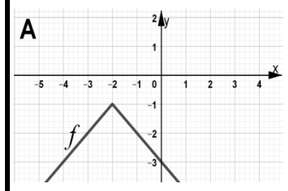
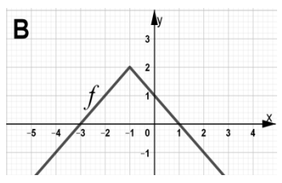
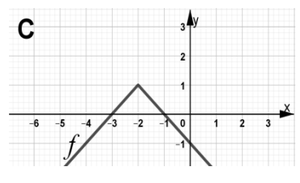
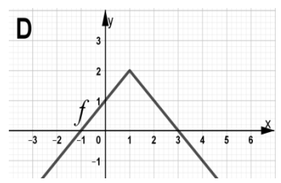
A 

B 

C 

D 

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12. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

13. Depending on the intermediate value theorem (IVT). If the function ***f*** is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

14. Find the result of $\lim\limits_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

15. Find the result of $\lim\limits_{x\to+\infty} \frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

16. The result of $\lim\limits_{x\to -2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

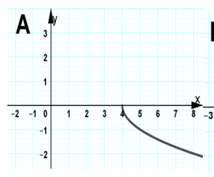
17. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

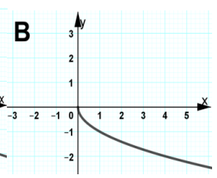
A. $]-1, 1[$ **B.** $]-\infty, -1[$ **C.** $]-1, +\infty[$ **D.** *None*

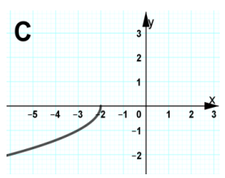
18. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2, \sqrt{3})$.

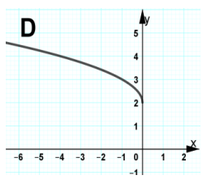
A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

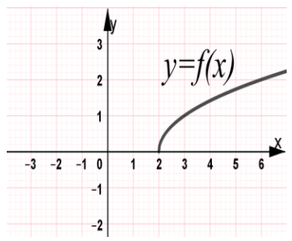
19. Use the given graph of the function $y = f(x)$ on the right , to determine the graph of the function $y = -f(x-2)$

A 

B 

C 

D 



20. Assume that x and y are two differentiable of a variable t . If $y = x^3 + 1$.

Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D.** $\frac{-1}{2}$

21. Find the value of k such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-k}{x}$. **A.** $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

22. Which of the following is true ?

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

23. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

24. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1, 0)$ **B.** $(2, 0)$ **C.** $(0, 0)$ **D.** None

25. Which of the following functions is symmetric with respect to the y - axis ?

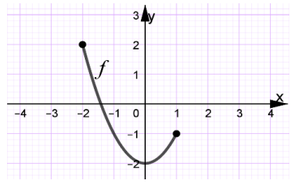
A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

26. If f *and* g are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

A. $(f\,g' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (f\,g)''$

C. $(f'g')' = f''g''$ D. $(f\,g)'' = f\,g'' + 2f'g' + f''g$

27. Determine the range of the function f from the given graph on the right .



A.$[-2\ ,2]$ **B.** $[-2\ ,1]$

C.$[-1\ ,2]$ **D.** $[0\ ,2]$

28. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

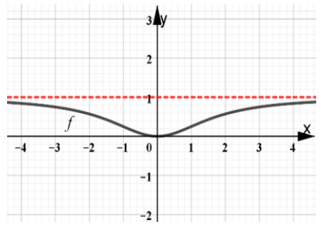
C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

29. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

30. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



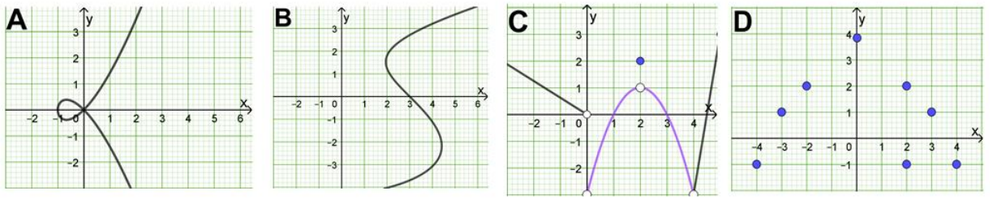
A. $f(x) = \frac{x^2}{x^2+3}$ **B.** $f(x) = \frac{x}{x^2+3}$

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

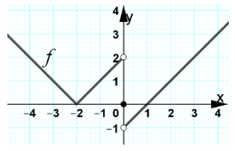
31. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

32. Which of the following graphs represents a function ?



33. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$

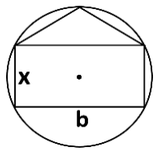


A. 0 **B.** -1 **C.** 2 **D.** Does not exist.

34. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m\ , 200\ m$ **B.** $400\ m\ , 128\ m$ **C.** $512\ m\ , 100\ m$ **D.** $320\ m\ , 160\ m$

35. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A.$\frac{3}{5}$ **B.**$\frac{2}{5}$ **C.**1 **D.** 2

36. The result of $\lim_{\Delta x\to 0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.**$6x$ **B.**$-6x$ **C.**$3x^2$ **D.** $-3x^2$

37. Find the value of $\boldsymbol{b}$ when the distance between the point$(\ 1\ , -3)$ and the line $3x - \boldsymbol{b}y = 5$ is$(zero)$

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

38. The result of $\lim_{x\to -1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.**-4 **C.** 4 **D.** $\frac{4}{5}$

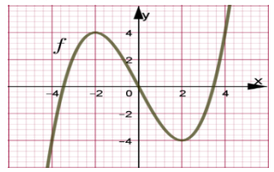
39. Find the result of $\lim_{x\to 0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

40. If $f(x) = 2\ (sinx)\ (cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

41. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.**$f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

42. The given graph on the right shows the curve of the function f On which interval is f' increasing ?



A. $]-\infty\ ,0[$ **B.** $]0\ ,+\infty[$

C. $]-\infty\ ,0[\cup]0\ ,+\infty[$ **D.** $]-\infty\ ,+\infty[$

43. The result of $\lim_{x\to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

44. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A.$f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

45. The function $f(x) = \frac{-1}{x+2}$ is always ..... in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

46. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .**$f(x) = \frac{x^2+x-6}{2x^2-8}$

47. Find the result of $\lim_{x\to -\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

48. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

49. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty\ ,0\ [$ **B.** $]-\infty\ ,4\ [$ **C.** $]\ 0\ ,+\infty[$ **D.** None

50. For what value of $\boldsymbol{a}$, does the function $f(x) = \begin{cases} \boldsymbol{a}x^2 + 1 & x \le 2 \\ 2x - \boldsymbol{a} & x > 2 \end{cases}$ has no points of discontinuity?

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

Kurdistan Region – Iraq SN: 30000022 In the Name of Allah Name: _____

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

General exams for preparatory stage (science) For the Academic year (2020-2021) First attemp 71054

Choose the correct option, two marks for each right answer

1. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

2. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

3. Find the result of $\lim_{x\to 0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

4. The result of $\lim_{x\to -1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

5. The result of $\lim_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

6. Find the result of $\lim_{x\to -\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

7. The result of $\lim_{\Delta x\to 0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

8. Which of the following is true ?

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

9. Which of the following functions is symmetric with respect to the y - axis ?

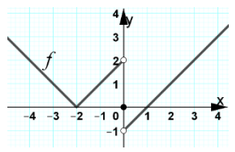
A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

10. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

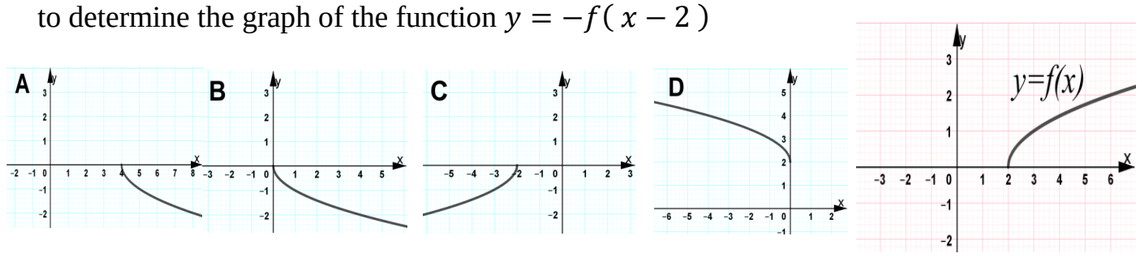
A. 2 **B.** -51 **C.** 51 **D.** -45

11. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$

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



12. Use the given graph of the function $y = f(x)$ on the right , to determine the graph of the function $y = -f(x-2)$



13. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

14. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

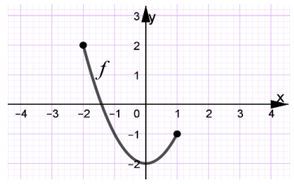
15. Find the result of $\lim_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

16. The result of $\lim_{x\to -2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

17. Determine the range of the function f from the given graph on the right .

A.$[-2\,,2]$ **B.** $[-2\,,1]$

C.$[-1\,,2]$ **D.** $[0\,,2]$



18. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t) = -16t^2 + 192\,t + 4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

What is the highest point the rocket can reach ?

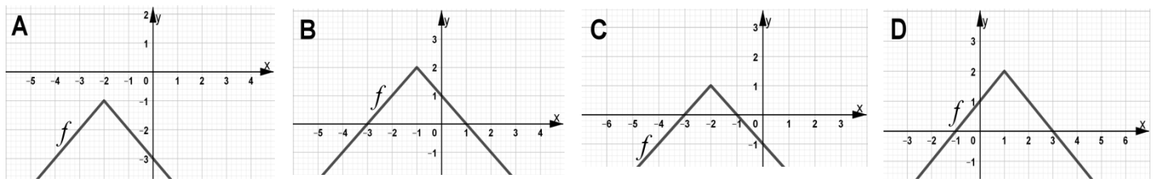
A. $404\,ft$ **B.** $580\,ft$ **C.** $606\,ft$ **D.** $768\,ft$

19. The function $f(x) = \frac{-1}{x+2}$ is always ..... in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

20. For what value of $\boldsymbol{a}$, does the function $f(x) = \begin{cases} \boldsymbol{ax^2 + 1} & x \leq 2 \\ \boldsymbol{2x - a} & x > 2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

21. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.



22. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

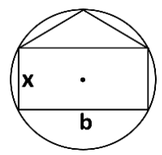
A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

23. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5\,,-3)$ **B.** $(-3\,,5)$ **C.** $(2\,,-1)$ **D .** $(-1\,,2)$

24. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?

A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.**1 **D.** 2



25. On which interval is the function $f(x)=\frac{x-1}{x+1}$ convex ?

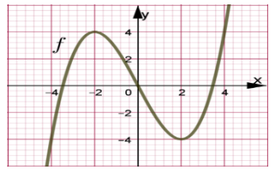
A. $]-1,1[$ **B.** $]-\infty,-1[$ **C.** $]-1,+\infty[$ **D.** *None*

26. The given graph on the right shows the curve of the function f

On which interval is f' increasing ?

A. $]-\infty,0[$ **B.** $]0,+\infty[$

C. $]-\infty,0[\cup]0,+\infty[$ **D.** $]-\infty,+\infty[$



27. The result of $\lim\limits_{x\to3^-}\frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

28. Which of the following functions has a removable discontinuity at $x=-3$?

A. $f(x)=\frac{x^2-9}{(x+3)^2}$ **B.** $f(x)=\frac{x^3+27}{2x+6}$ **C.** $f(x)=\frac{x^2+9}{x+3}$ **D.** $f(x)=\frac{|x+3|}{2x+6}$

29. Find the result of $\lim\limits_{x\to+\infty}\frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

30. Which of the following functions has no vertical asymptote at $x=2$?

A. $f(x)=\frac{x^2-4}{(x-2)^2}$ **B.** $f(x)=\frac{x+2}{x^2-4}$ **C.** $f(x)=\frac{x^2+4}{x^2-3x+2}$ **D** $.f(x)=\frac{x^2+x-6}{2x^2-8}$

31. If $f(x)=x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

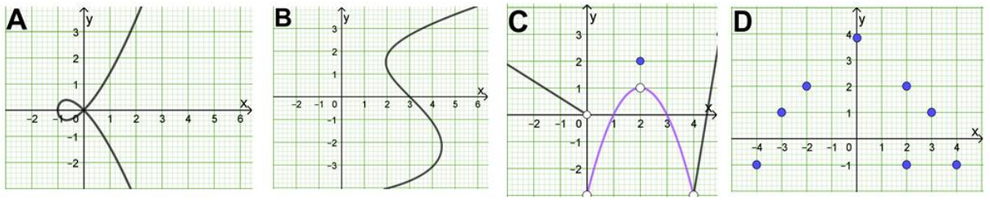
A. x^2-2x **B.** x^2+2x **C.** x^2+2x+4 **D.** x^2-2x+4

32. Find the point of inflection for the function $f(x)=3x(x-1)(x-2)$.

A. $(1,0)$ **B.** $(2,0)$ **C.** $(0,0)$ **D.** None

33. Find the equation of the line that passes through the point $(-4,1)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

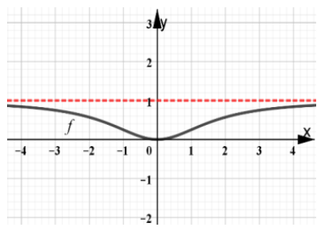
34. Which of the following graphs represents a function ?



35. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .

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

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



36. Assume that x and y are two differentiable of a variable t . If $y=x^3+1$.

Find $\frac{dx}{dt}$ at $x=2$, by knowing that $\frac{dy}{dt}=-3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D** $.\frac{-1}{2}$

37. Find the derivative of the function $f(x)=x\,e^x$.

A. $f'(x)=e^x$ **B.** $f'(x)=e^x(x+1)$ **C.** $f'(x)=e^x+1$ **D.** $f'(x)=xe^x+1$

38. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

39. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

40. Depending on the intermediate value theorem (IVT). If the function $\boldsymbol{f}$ is continuous between ($x=a$ and $x=b$) , then the equation $f(x)=0$ has at least one root between two numbers **a** and **b** when the signs $f(a)\ and\ f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

41. Find the third derivative of the function $f(x)=\frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x)=\frac{-24}{x^4}$ **B.** $f'''(x)=\frac{24}{x^4}$ **C.** $f'''(x)=\frac{-96}{x^5}$ **D.** $f'''(x)=\frac{96}{x^5}$

42. On which interval is the function $f(x)=x^{\frac{2}{3}}-4$ decreasing ?

A. $]-\infty,0[$ **B.** $]-\infty,4[$ **C.** $]0,+\infty[$ **D.** None

43. If $f(x)=2x-4\ \ and\ \ g(x)=1+3x$, find the value of x when $f(x)=g(x)$.

A. $x=-1$ **B.** $x=1$ **C.** $x=5$ **D.** $x=-5$

44. Find the value of $\boldsymbol{b}$ when the distance between the point $(1,-3)$ and the line $3x-\boldsymbol{b}y=5$ is$(zero)$

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

45. Find the domain of the function $g\circ f$ when $f(x)=4-x^2$ and $g(x)=-\sqrt{x}$.

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

46. If $f\ and\ g$ are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

A. $(f\,g'-f'g)'=f'g''-f''g'$ B. $fg''+f''g=(f\,g)''$

C. $(f'g')'=f''g''$ D. $(f\,g)''=f\,g''+2f'g'+f''g$

47. Find the value of $\boldsymbol{k}$ such that the line $y=\frac{3}{4}x+3$ is tangent to the graph of the function $f(x)=\frac{-\boldsymbol{k}}{\boldsymbol{x}}$. **A.** $k=2$ **B.** $k=-2$ **C.** $k=3$ **D.** $k=-3$

48. Find the slope of the tangent line to the graph $y^2=\frac{x+1}{x-1}$ at the point $(2,\sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

49. If $f(x)=2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D** $.-2$

50. Find the equation of a line passing through the points $(-2,-4)$ and $(-2,4)$.

A. $x=-2$ **B.** $y=-2$ **C.** $y=-4$ **D.** $y=-2x-8$

Kurdistan Region – Iraq SN: 30000023 **In the Name of Allah** **Name:** _____

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

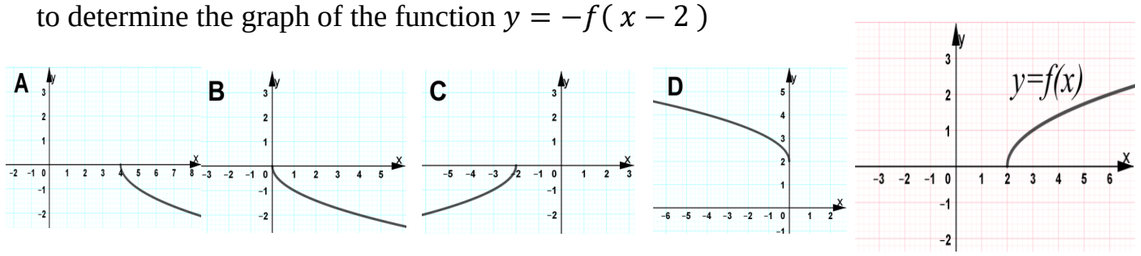
General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

Choose the correct option, two marks for each right answer

1. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

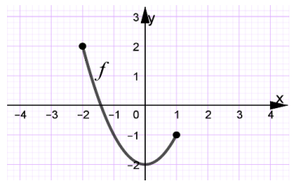
A. $(1\,,0)$ **B.** $(2\,,0)$ **C.** $(0\,,0)$ **D.** None

2. Use the given graph of the function $y = f(x)$ on the right ,
to determine the graph of the function $y = -f(x-2)$



3. Determine the range of the function f
from the given graph on the right .

A.$[-2\,,2]$ **B.** $[-2\,,1]$
C.$[-1\,,2]$ **D.** $[0\,,2]$



4. Which of the following is true ?

A. $\lim\limits_{x\to+\infty}(2+\frac{sinx}{x}) = 2$ **B.** $\lim\limits_{x\to2}\frac{3}{x-2} = 3$ **C.** $\lim\limits_{x\to1}\frac{x^2-1}{x-1} = 0$ **D.** $\lim\limits_{x\to0}\frac{sinx}{x} = 0$

5. Find the result of $\lim\limits_{x\to-\infty}\frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

6. For what value of $\boldsymbol{a}$, does the function $f(x) = \begin{cases} \boldsymbol{a}x^2+1 & x \le 2 \\ 2x-\boldsymbol{a} & x > 2 \end{cases}$ has no points
of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

7. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.**$\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

8. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

9. Find the derivative of the function $f(x) = x\,e^x$.

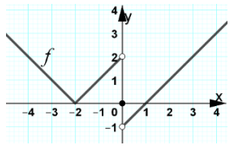
A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.**$f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

10. Which of the following functions has a removable discontinuity at $x = -3$?

A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

11. Use the given graph on the right
to find the result of $\lim\limits_{x\to0^+} f(x)$

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



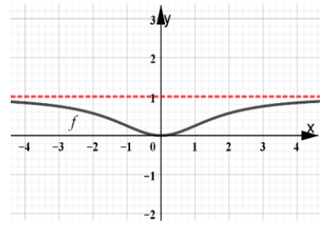
12. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

13. Use the intercepts , symmetry , asymptotes , first and second derivative test
to determine the function of the given graph .

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

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



14. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.**$f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

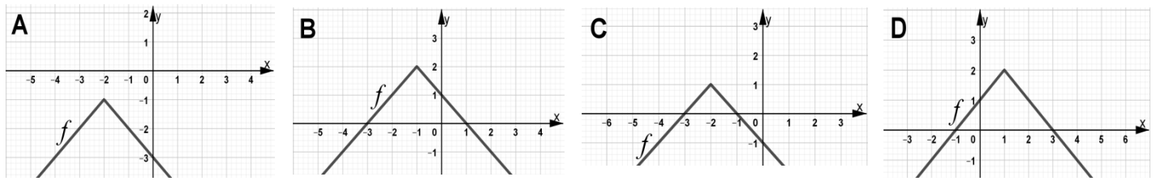
15. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.**$y = |x+2| - 2$ **D.** $x^2y - x = 0$

16. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty\,,0\,[$ **B.** $]-\infty\,,4\,[$ **C.** $]\,0\,,+\infty[$ **D.** None

17. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.



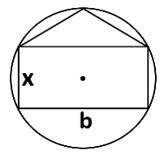
18. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A.$]-1\,,1\,[$ **B.** $]-\infty\,,-1[$ **C.**$]-1\,,+\infty[$ **D.** *None*

19. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2\,,\sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

20. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



A.$\frac{3}{5}$ **B.**$\frac{2}{5}$ **C.**1 **D.** 2

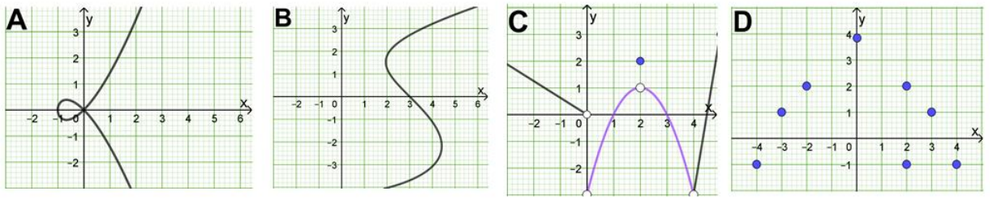
21. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t)} = \boldsymbol{-16t^2 + 192\,t + 4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet
What is the highest point the rocket can reach ?

A. $404\,ft$ **B.** $580\,ft$ **C.** $606\,ft$ **D.** $768\,ft$

22. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D .** $(-1, 2)$

23. Which of the following graphs represents a function ?

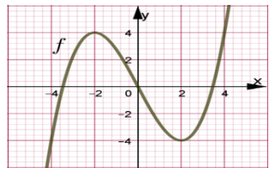


24. The function $f(x) = \frac{-1}{x+2}$ is always ..... in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

25. The given graph on the right shows the curve of the function f

On which interval is f' increasing ?



A. $]-\infty, 0[$ **B.** $]0, +\infty[$

C. $]-\infty, 0[\cup]0, +\infty[$ **D.** $]-\infty, +\infty[$

26. Find the value of $\boldsymbol{b}$ when the distance between the point $(1, -3)$ and the line $3x - by = 5$ is $(zero)$

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

27. Find the equation of a line passing through the points $(-2, -4)$ and $(-2, 4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

28. The result of $\lim_{x \to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

29. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

30. Find the value of $\boldsymbol{k}$ such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-k}{x}$. **A.** $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

31. The result of $\lim_{\Delta x \to 0} \frac{-3(x+\Delta x)^2 + 3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

32. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .** $f(x) = \frac{x^2+x-6}{2x^2-8}$

33. The result of $\lim_{x \to -1} \frac{x^2 + 2x + 1}{x^2 + 3x + 2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

34. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m, 200\ m$ **B.** $400\ m, 128\ m$ **C.** $512\ m, 100\ m$ **D.** $320\ m, 160\ m$

35. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

36. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

37. The result of $\lim_{x \to -2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

38. Find the result of $\lim_{x \to 0} \frac{\sqrt{x+5} - \sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

39. If f *and* g are two differentiable function for all x , and so are their derivatives.

Which of the following is true ?

A. $(f\,g' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (f\,g)''$

C. $(f'g')' = f''g''$ D. $(f\,g)'' = f\,g'' + 2f'g' + f''g$

40. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

41. Depending on the intermediate value theorem (IVT). If the function $\boldsymbol{f}$ is continuous between $(x = a$ and $x = b)$, then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are .....

A. Positive **B.** Negative **C.** Opposite **D.** None

42. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

43. Find the result of $\lim_{x \to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

44. Find the equation of the line that passes through the point $(-4, 1)$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

45. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

46. Find the result of $\lim_{x \to +\infty} \frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

47. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

48. The result of $\lim_{x \to 0} \frac{-x}{\sqrt{x+1} - 1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

49. Assume that $\boldsymbol{x}$ and $\boldsymbol{y}$ are two differentiable of a variable $\boldsymbol{t}$. If $y = x^3 + 1$.

Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

50. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

Kurdistan Region – Iraq SN: 30000024 In the Name of Allah Name: _____

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

General exams for preparatory stage (science) For the Academic year (2020-2021) First attemp

71054

Choose the correct option, two marks for each right answer

1. The function $f(x)=\frac{-1}{x+2}$ is always ..... in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

2. Which of the following functions has a vertical asymptote at $x=3$ and slant asymptote at $y=-2x$?

A. $f(x)=\frac{2x}{3-x}$ **B.** $f(x)=\frac{-2x^2+6x+1}{x-3}$ **C.** $f(x)=\frac{-4x^2-18x}{2x-6}$ **D.** $f(x)=\frac{-x^2+12x}{x-3}$

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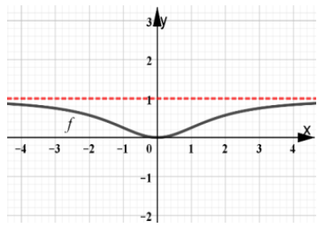
A. $f(x)=\frac{x^2-4}{(x-2)^2}$ **B.** $f(x)=\frac{x+2}{x^2-4}$ **C.** $f(x)=\frac{x^2+4}{x^2-3x+2}$ **D** $f(x)=\frac{x^2+x-6}{2x^2-8}$

4. If $f(x)=x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

5. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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

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

6. Find the point of inflection for the function $f(x)=3x(x-1)(x-2)$.

A. $(1\,,0)$ **B.** $(2\,,0)$ **C.** $(0\,,0)$ **D.** None

7. Find the result of $\lim\limits_{x\to-\infty}\frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

8. Find the third derivative of the function $f(x)=\frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x)=\frac{-24}{x^4}$ **B.** $f'''(x)=\frac{24}{x^4}$ **C.** $f'''(x)=\frac{-96}{x^5}$ **D.** $f'''(x)=\frac{96}{x^5}$

9. Depending on the intermediate value theorem (IVT). If the function ***f*** is continuous between ($x=a$ and $x=b$) , then the equation $f(x)=0$ has at least one root between two numbers **a** and **b** when the signs $f(a)\ and\ f(b)$ are .....

A. Positive **B.** Negative **C.** Opposite **D.** None

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11. Assume that ***x*** and ***y*** are two differentiable of a variable ***t*** . If $y=x^3+1$.

Find $\frac{dx}{dt}$ at $x=2$, by knowing that $\frac{dy}{dt}=-3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D** . $\frac{-1}{2}$

12. If $x^2-xy+y^2=1$ then which of the following is equal to $\frac{dy}{dx}$?

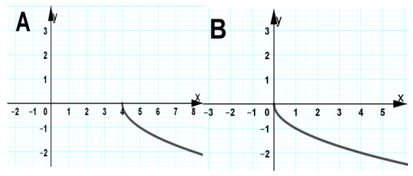
A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

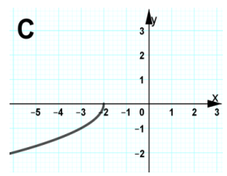
0024

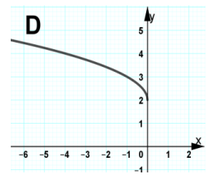
13. Determine the equation of the horizontal asymptote of the function $f(x)=\frac{2x-3x^2+1}{2x^2+5x}$.

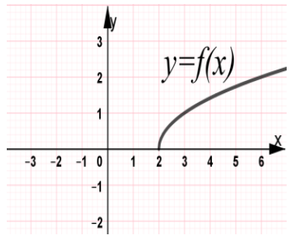
A. $y=1$ **B.** $y=\frac{-3}{2}$ **C.** $y=\frac{-3}{5}$ **D.** $y=0$

14. Use the given graph of the function $y=f(x)$ on the right , to determine the graph of the function $y=-f(x-2)$



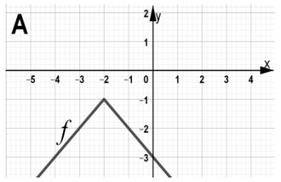


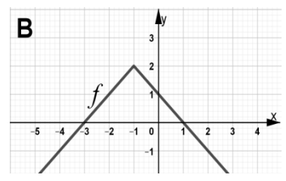


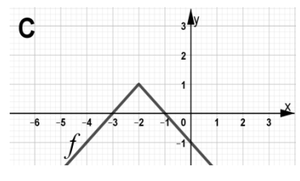


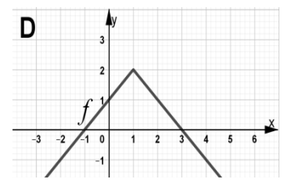
15. Find the result of $\lim\limits_{x\to0}\frac{\frac{5}{2x+10}-\frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

16. Determine the graph of the function $f(x)=2-|x+1|$ by using point plotting.









17. Find the domain of the function $g\circ f$ when $f(x)=4-x^2$ and $g(x)=-\sqrt{x}$.

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

18. IF $f(x)=3ax^3+3$ is a function and $f'(3)=-162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

19. The line $y=-4x+7$ passes through which of the following points ?

A. $(5\,,-3)$ **B.** $(-3\,,5)$ **C.** $(2\,,-1)$ **D** . $(-1\,,2)$

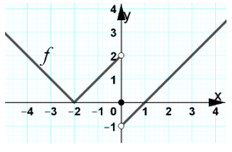
20. The result of $\lim\limits_{x\to0}\frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

21. The result of $\lim\limits_{\Delta x\to0}\frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

22. Find the derivative of the function $f(x)=x\,e^x$.

A. $f'(x)=e^x$ **B.** $f'(x)=e^x(x+1)$ **C.** $f'(x)=e^x+1$ **D.** $f'(x)=xe^x+1$

23. Use the given graph on the right to find the result of $\lim\limits_{x\to0^+}f(x)$



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

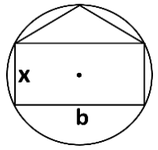
24. Redefine the function $f(x)=\frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x=1$.

A. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ 1 & x=1\end{cases}$ **B.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ \sqrt{2} & x=1\end{cases}$

C. $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ 0 & x=1\end{cases}$ **D.** $g(x)=\begin{cases}\frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x\neq1\\ -1 & x=1\end{cases}$

25. The result of $\lim\limits_{x\to-1}\frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

26. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



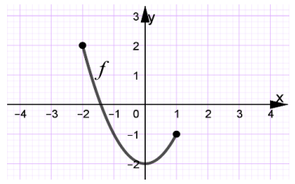
A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

27. The result of $\lim_{x\to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

28. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A. $]-1\,,1\,[$ **B.** $]-\infty\,,-1[$ **C.** $]-1\,,+\infty[$ **D.** *None*

29. Determine the range of the function f from the given graph on the right .



A. $[-2\,,2]$ **B.** $[-2\,,1]$
C. $[-1\,,2]$ **D.** $[0\,,2]$

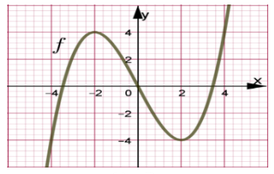
30. For what value of $\boldsymbol{a}$, does the function $f(x) = \begin{cases} \boldsymbol{a}x^2+1 & x \le 2 \\ 2x-\boldsymbol{a} & x > 2 \end{cases}$ has no points of discontinuity?

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

31. In a fireworks festival, a rocket is launched upward .The function $\boldsymbol{S(t)} = \boldsymbol{-16t^2 + 192\,t + 4}$ is the position function of the rocket, **t** is measured in seconds and **S** in feet
What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

32. The given graph on the right shows the curve of the function f
On which interval is f' increasing ?



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

33. Which of the following functions has a removable discontinuity at $x=-3$?

A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

34. Find the result of $\lim_{x\to+\infty} \frac{\ln x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

35. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m\,,200\ m$ **B.** $400\ m\,,128\ m$ **C.** $512\ m\,,100\ m$ **D.** $320\ m\,,160\ m$

36. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

37. Which of the following is true ?

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

38. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty\,,0\,[$ **B.** $]-\infty\,,4\,[$ **C.** $]\,0\,,+\infty[$ **D.** None

39. Find the value of $\boldsymbol{b}$ when the distance between the point $(\,1\,,-3)$ and the line $3x - \boldsymbol{b}y = 5$ is$(zero)$

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

40. Find the equation of the line that passes through the point $(-4\,,1\,)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

41. Find the result of $\lim_{x\to 0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

42. Find the equation of a line passing through the points $(-2\,,-4)$ and $(-2\,,4\,)$.

A. $x=-2$ **B.** $y=-2$ **C.** $y=-4$ **D.** $y=-2x-8$

43. Find the slope of the tangent line to the graph $y^2 = \frac{x+1}{x-1}$ at the point $(2\,,\sqrt{3}\,)$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

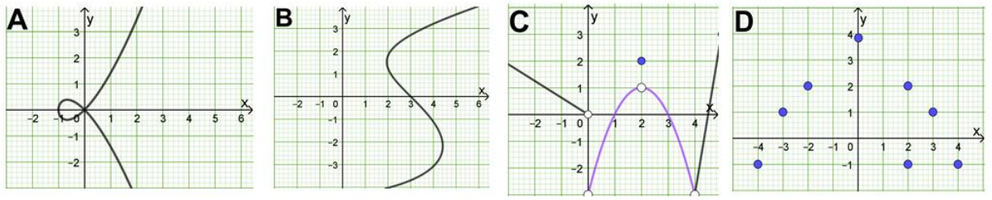
44. If $f(x) = 2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

45. Find the value of $\boldsymbol{k}$ such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-\boldsymbol{k}}{\boldsymbol{x}}$. **A.** $k=2$ **B.** $k=-2$ **C.** $k=3$ **D.** $k=-3$

46. If f *and* g are two differentiable function for all x , and so are their derivatives.
Which of the following is true ?

A. $(f\,g' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (f\,g)''$
C. $(f'g')' = f''g''$ D. $(f\,g)'' = f\,g'' + 2f'g' + f''g$

47. Which of the following graphs represents a function ?



48. The result of $\lim_{x\to -2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

49. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x=-1$ **B.** $x=1$ **C.** $x=5$ **D.** $x=-5$

50. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.
B.If $f'(x) = g'(x)$, then $f(x) = g(x)$
C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$
D. If $y = \frac{2x}{\pi}$, then $\frac{d\,y}{dx} = \frac{2}{\pi}$

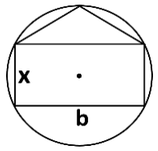
Kurdistan Region – Iraq SN: 30000025 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

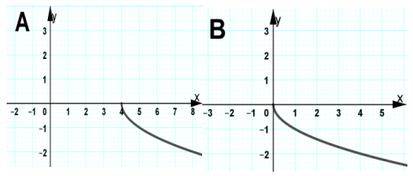
Choose the correct option, two marks for each right answer

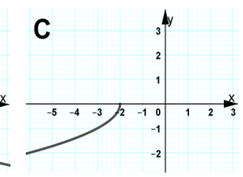
1. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?

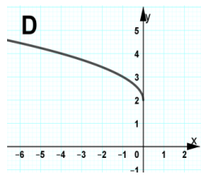


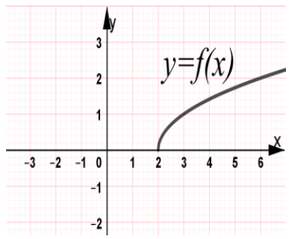
A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

2. Use the given graph of the function $y = f(x)$ on the right , to determine the graph of the function $y = -f(x-2)$









3. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

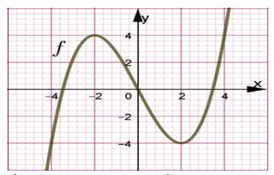
C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

4. Find the third derivative of the function $f(x) = \frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x) = \frac{-24}{x^4}$ **B.** $f'''(x) = \frac{24}{x^4}$ **C.** $f'''(x) = \frac{-96}{x^5}$ **D.** $f'''(x) = \frac{96}{x^5}$

5. The result of $\lim_{x\to 0} \frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

6. The given graph on the right shows the curve of the function f On which interval is f' increasing ?



A. $]-\infty, 0[$ **B.** $]0, +\infty[$

C. $]-\infty, 0[\cup]0, +\infty[$ **D.** $]-\infty, +\infty[$

7. Find the result of $\lim_{x\to 0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

8. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty, 0[$ **B.** $]-\infty, 4[$ **C.** $]0, +\infty[$ **D.** None

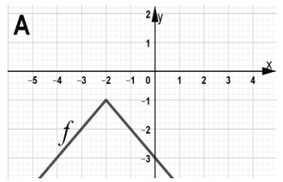
9. Depending on the intermediate value theorem (IVT). If the function ***f*** is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

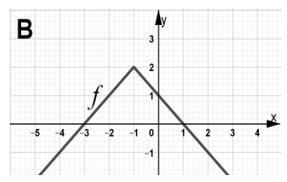
A. Positive **B.** Negative **C.** Opposite **D.** None

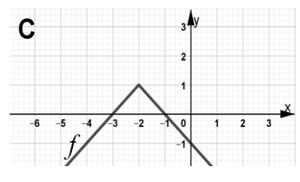
10. The line $y = -4x + 7$ passes through which of the following points ?

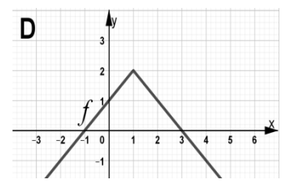
A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D .** $(-1, 2)$

11. Determine the graph of the function $f(x) = 2 - |x+1|$ by using point plotting.

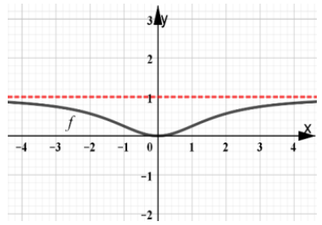








12. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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

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

13. The result of $\lim_{\Delta x\to 0} \frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

14. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

15. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .** $f(x) = \frac{x^2+x-6}{2x^2-8}$

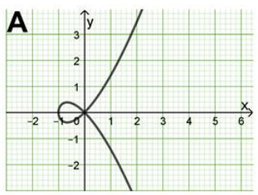
16. Which of the following functions has a removable discontinuity at $x = -3$?

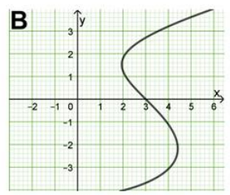
A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

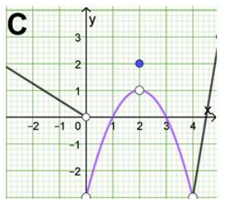
17. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

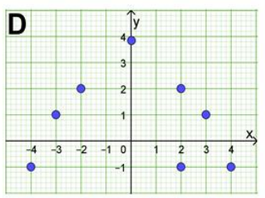
A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

18. Which of the following graphs represents a function ?









19. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{2x-3x^2+1}{2x^2+5x}$.

A. $y = 1$ **B.** $y = \frac{-3}{2}$ **C.** $y = \frac{-3}{5}$ **D.** $y = 0$

20. For what value of a , does the function $f(x) = \begin{cases} ax^2 + 1 & x \leq 2 \\ 2x - a & x > 2 \end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D .** $\frac{3}{5}$

21. The function $f(x) = \frac{-1}{x+2}$ is always ……. in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

22. In a fireworks festival, a rocket is launched upward .The function $S(t) = -16t^2 + 192\,t + 4$ is the position function of the rocket, **t** is measured in seconds and **S** in feet
What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

23. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

A. $256\ m\ , 200\ m$ **B.** $400\ m\ , 128\ m$ **C.** $512\ m\ , 100\ m$ **D.** $320\ m\ , 160\ m$

24. IF $f(x) = 3ax^3 + 3$ is a function and $f'(3) = -162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

25. Find the value of k such that the line $y = \frac{3}{4}x + 3$ is tangent to the graph of the function $f(x) = \frac{-k}{x}$.

A. $k = 2$ **B.** $k = -2$ **C.** $k = 3$ **D.** $k = -3$

26. Find the value of b when the distance between the point$(\ 1\ , -3)$ and the line $3x - by = 5$ is$(zero)$

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

27. If $x^2 - xy + y^2 = 1$ then which of the following is equal to $\frac{dy}{dx}$?

A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

28. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B.If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

29. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

30. Find the result of $\lim\limits_{x\to-\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

31. If $f(x) = 2x - 4$ *and* $g(x) = 1 + 3x$, find the value of x when $f(x) = g(x)$.

A. $x = -1$ **B.** $x = 1$ **C.** $x = 5$ **D.** $x = -5$

32. The result of $\lim\limits_{x\to3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

33. If $f(x) = 2\ (sinx)\ (\ cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D .** -2

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

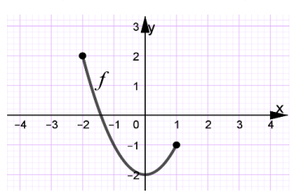
A. $f'(x) = e^x$ **B.** $f'(x) = e^x(x+1)$ **C.** $f'(x) = e^x + 1$ **D.** $f'(x) = xe^x + 1$

35. Find the point of inflection for the function $f(x) = 3x(x-1)(x-2)$.

A. $(1\ , 0\ )$ **B.** $(\ 2\ , 0\ )$ **C.** $(\ 0\ , 0\ )$ **D.** None

36. Determine the range of the function f from the given graph on the right .

A.$[-2\ , 2]$ **B.** $[-2\ , 1]$
C.$[-1\ , 2]$ **D.** $[0\ , 2]$



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

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

38. If f *and* g are two differentiable function for all x , and so are their derivatives.
Which of the following is true ?

A. $(f\,g' - f'g)' = f'g'' - f''g'$ B. $fg'' + f''g = (f\,g)''$
C. $(f'g')' = f''g''$ D. $(f\,g)'' = f\,g'' + 2f'g' + f''g$

39. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

40. Find the equation of a line passing through the points $(-2\ , -4)$ and $(-2\ , 4\ )$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

41. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A.$]-1\ , 1\ [$ **B.** $]-\infty\ , -1[$ **C.**$]-1\ , +\infty[$ **D.** $None$

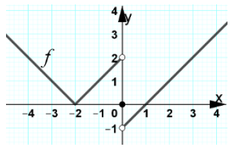
42. Find the result of $\lim\limits_{x\to0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

43. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y - x^2 + 3y = 0$ **B.** $y = \sqrt{x-4}$ **C.** $y = |x+2| - 2$ **D.** $x^2y - x = 0$

44. Use the given graph on the right to find the result of $\lim\limits_{x\to0^+} f(x)$

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



45. The result of $\lim\limits_{x\to-2} \frac{\frac{1}{1-x} - \frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

46. The result of $\lim\limits_{x\to-1} \frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.**-4 **C.** 4 **D.** $\frac{4}{5}$

47. Which of the following is true ?

A. $\lim\limits_{x\to+\infty} (2 + \frac{sinx}{x}) = 2$ **B.** $\lim\limits_{x\to2} \frac{3}{x-2} = 3$ **C.** $\lim\limits_{x\to1} \frac{x^2-1}{x-1} = 0$ **D.** $\lim\limits_{x\to0} \frac{sinx}{x} = 0$

48. Find the equation of the line that passes through the point $(-4\ , 1\ )$ and perpendicular to the y – axis . **A.** $x + 4 = 0$ **B.** $y - 4x = 0$ **C.** $y - 1 = 0$ **D.** $y + 3 = 0$

49. Find the result of $\lim\limits_{x\to+\infty} \frac{ln\,x^4}{x^3}$ (Use L'Hopital's rule) : **A.** 0 **B.** 1 **C.** $\frac{1}{4}$ **D.** $+\infty$

50. Assume that x and y are two differentiable of a variable t . If $y = x^3 + 1$.

Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D .** $\frac{-1}{2}$

Kurdistan Region – Iraq SN: 30000026 **In the Name of Allah** **Name:** _____

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

General exams for preparatory stage (science) **For the Academic year (2020-2021) First attemp** 71054

Choose the correct option, two marks for each right answer

1. The result of $\lim\limits_{x\to 0}\frac{-x}{\sqrt{x+1}-1}$ is: **A.** 0 **B.** -1 **C.** -2 **D.** Does not exist.

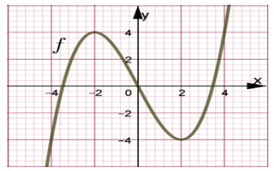
2. The result of $\lim\limits_{x\to -1}\frac{x^2+2x+1}{x^2+3x+2}$ is : **A.** 0 **B.** -4 **C.** 4 **D.** $\frac{4}{5}$

3. The volume of a cube increases an average of $(\mathbf{36}\ cm^3/min)$, while its surface area increases $(\mathbf{18}\ cm^2/min)$, what is the length of the side of the cube ?

A. $2\ cm$ **B.** $4\ cm$ **C.** $2\sqrt{2}\ cm$ **D.** $8\ cm$

4. The result of $\lim\limits_{\Delta x\to 0}\frac{-3(x+\Delta x)^2+3x^2}{\Delta x}$ is : **A.** $6x$ **B.** $-6x$ **C.** $3x^2$ **D.** $-3x^2$

5. The given graph on the right shows the curve of the function f
On which interval is f' increasing ?

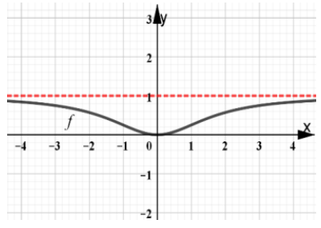


A. $]-\infty,0[$ **B.** $]0,+\infty[$
C. $]-\infty,0[\cup]0,+\infty[$ **D.** $]-\infty,+\infty[$

6. If $x^2-xy+y^2=1$ then which of the following is equal to $\frac{dy}{dx}$?

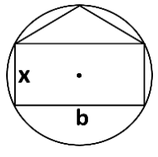
A. $\frac{y+2x}{2y-x}$ **B.** $\frac{2x}{2y-x}$ **C.** $\frac{y-2x}{2y-x}$ **D.** $\frac{-2x}{2y-x}$

7. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the function of the given graph .



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

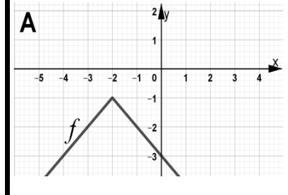
8. The figure on the right shows a rectangle and an isosceles triangle inscribed in a circle of diameter (5) . What is the value of (x) that will make the areas of the rectangle and the triangle equal ?



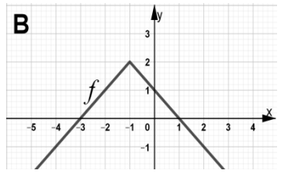
A. $\frac{3}{5}$ **B.** $\frac{2}{5}$ **C.** 1 **D.** 2

9. Determine the graph of the function $f(x)=2-|x+1|$ by using point plotting.

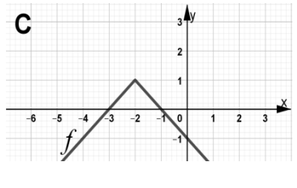
A



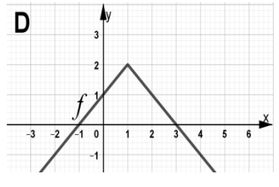
B



C



D



10. The function $f(x)=\frac{-1}{x+2}$ is always ..... in its domain .

A. Increasing **B.** Decreasing **C.** Concave **D.** Convex

11. Find the slope of the tangent line to the graph $y^2=\frac{x+1}{x-1}$ at the point $(2,\sqrt{3})$.

A. $\frac{1}{\sqrt{3}}$ **B.** $-\frac{1}{\sqrt{3}}$ **C.** $-\frac{2}{\sqrt{3}}$ **D.** $\frac{2}{\sqrt{3}}$

0026

12. Which of the following functions is symmetric with respect to the y - axis ?

A. $x^2y-x^2+3y=0$ **B.** $y=\sqrt{x-4}$ **C.** $y=|x+2|-2$ **D.** $x^2y-x=0$

13. Find the value of $\boldsymbol{b}$ when the distance between the point $(1,-3)$ and the line $3x-\boldsymbol{b}y=5$ $(zero)$

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

14. Find the value of $\boldsymbol{k}$ such that the line $y=\frac{3}{4}x+3$ is tangent to the graph of the function $f(x)=\frac{-\boldsymbol{k}}{\boldsymbol{x}}$. **A.** $k=2$ **B.** $k=-2$ **C.** $k=3$ **D.** $k=-3$

15. If $f(x)=2\,(sinx)\,(cosx)$, find the result of $f'(\pi)$: **A.** 2π **B.** -2π **C.** 2 **D.** -2

16. IF $f(x)=3ax^3+3$ is a function and $f'(3)=-162$, find the result of $f(2)$.

A. 2 **B.** -51 **C.** 51 **D.** -45

17. Find the equation of the line that passes through the point $(-4,1)$ and perpendicular to the y – axis . **A.** $x+4=0$ **B.** $y-4x=0$ **C.** $y-1=0$ **D.** $y+3=0$

18. For what value of $\boldsymbol{a}$, does the function $f(x)=\begin{cases}\boldsymbol{a}x^2+1 & x\le 2\\ 2x-\boldsymbol{a} & x>2\end{cases}$ has no points of discontinuity? **A.** $\frac{-3}{5}$ **B.** $\frac{-5}{3}$ **C.** $\frac{5}{3}$ **D.** $\frac{3}{5}$

19. Find the point of inflection for the function $f(x)=3x(x-1)(x-2)$.

A. $(1,0)$ **B.** $(2,0)$ **C.** $(0,0)$ **D.** None

20. A farmer plans to fence a rectangular pasture adjacent to a river . The area of the pasture must contain $(51200\ m^2)$. What dimensions would be required for the least amount of fencing if fencing is not needed along the river.

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22. If $f(x)=2x-4$ and $g(x)=1+3x$, find the value of x when $f(x)=g(x)$.

A. $x=-1$ **B.** $x=1$ **C.** $x=5$ **D.** $x=-5$

23. Which of the following is true ?

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

24. Find the derivative of the function $f(x)=x\,e^x$.

A. $f'(x)=e^x$ **B.** $f'(x)=e^x(x+1)$ **C.** $f'(x)=e^x+1$ **D.** $f'(x)=xe^x+1$

25. Determine the equation of the horizontal asymptote of the function $f(x)=\frac{2x-3x^2+1}{2x^2+5x}$.

A. $y=1$ **B.** $y=\frac{-3}{2}$ **C.** $y=\frac{-3}{5}$ **D.** $y=0$

26. If f and g are two differentiable function for all x , and so are their derivatives. Which of the following is true ?

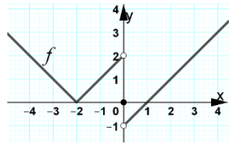
A. $(f\,g'-f'g)'=f'g''-f''g'$ B. $fg''+f''g=(f\,g)''$
C. $(f'g')'=f''g''$ D. $(f\,g)''=f\,g''+2f'g'+f''g$

27. Find the third derivative of the function $f(x)=\frac{x^3-3x^2+4}{x^2}$.

A. $f'''(x)=\frac{-24}{x^4}$ **B.** $f'''(x)=\frac{24}{x^4}$ **C.** $f'''(x)=\frac{-96}{x^5}$ **D.** $f'''(x)=\frac{96}{x^5}$

28. The result of $\lim\limits_{x\to -2}\frac{\frac{1}{1-x}-\frac{1}{3}}{x+2}$ is : **A.** 9 **B.** -9 **C.** $\frac{-1}{9}$ **D.** $\frac{1}{9}$

29. Use the given graph on the right to find the result of $\lim_{x\to 0^+} f(x)$



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

30. Which of the following functions has a vertical asymptote at $x = 3$ and slant asymptote at $y = -2x$?

A. $f(x) = \frac{2x}{3-x}$ **B.** $f(x) = \frac{-2x^2+6x+1}{x-3}$ **C.** $f(x) = \frac{-4x^2-18x}{2x-6}$ **D.** $f(x) = \frac{-x^2+12x}{x-3}$

31. Which of the following is false ?

A. The graph of a cubic function has exactly one point of inflection.

B. If $f'(x) = g'(x)$, then $f(x) = g(x)$

C. If $g(x) = -5f(x)$, then $g'(x) = -5f'(x)$

D. If $y = \frac{2x}{\pi}$, then $\frac{dy}{dx} = \frac{2}{\pi}$

32. Redefine the function $f(x) = \frac{\sqrt{2-x}-\sqrt{x}}{x-1}$ to be continuous at $x = 1$.

A. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$ **B.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ \sqrt{2} & x = 1 \end{cases}$

C. $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ **D.** $g(x) = \begin{cases} \frac{\sqrt{2-x}-\sqrt{x}}{x-1} & x \neq 1 \\ -1 & x = 1 \end{cases}$

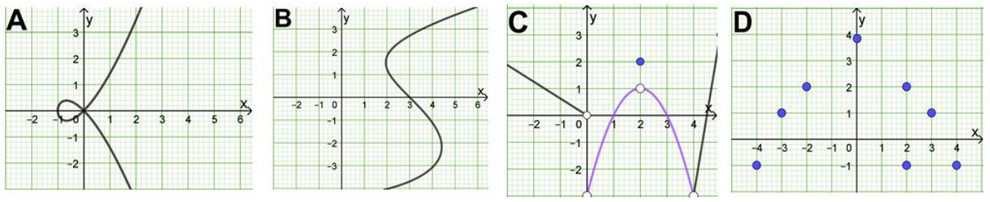
33. Which of the following functions has a removable discontinuity at $x = -3$?

A. $f(x) = \frac{x^2-9}{(x+3)^2}$ **B.** $f(x) = \frac{x^3+27}{2x+6}$ **C.** $f(x) = \frac{x^2+9}{x+3}$ **D.** $f(x) = \frac{|x+3|}{2x+6}$

34. Find the equation of a line passing through the points $(-2, -4)$ and $(-2, 4)$.

A. $x = -2$ **B.** $y = -2$ **C.** $y = -4$ **D.** $y = -2x - 8$

35. Which of the following graphs represents a function ?



36. Assume that x and y are two differentiable of a variable t . If $y = x^3 + 1$.

Find $\frac{dx}{dt}$ at $x = 2$, by knowing that $\frac{dy}{dt} = -3$.

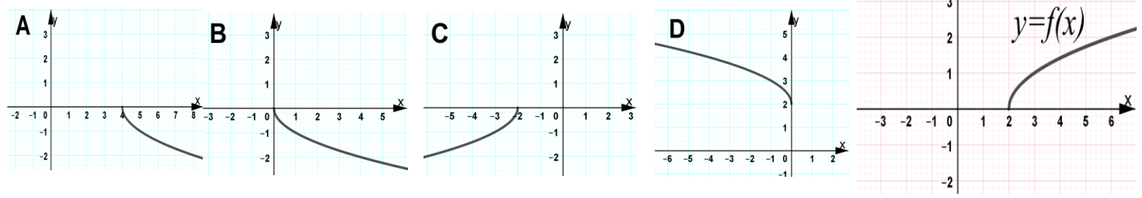
A. $\frac{1}{4}$ **B.** $\frac{-1}{4}$ **C.** $\frac{1}{2}$ **D.** $\frac{-1}{2}$

37. In a fireworks festival, a rocket is launched upward .The function $S(t) = -16t^2 + 192t + 4$ is the position function of the rocket, **t** is measured in seconds and **S** in feet

What is the highest point the rocket can reach ?

A. $404\ ft$ **B.** $580\ ft$ **C.** $606\ ft$ **D.** $768\ ft$

38. Use the given graph of the function $y = f(x)$ on the right , to determine the graph of the function $y = -f(x-2)$



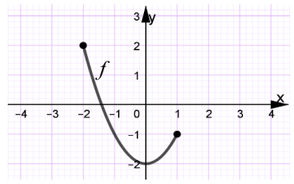
39. The result of $\lim_{x\to 3^-} \frac{2-x}{x-3}$ is : **A.** $-\infty$ **B.** $+\infty$ **C.** 0 **D.** -1

40. Find the result of $\lim_{x\to -\infty} \frac{-3x}{\sqrt{x^2+1}}$. **A.** -3 **B.** 3 **C.** $+\infty$ **D.** 0

41. The line $y = -4x + 7$ passes through which of the following points ?

A. $(5, -3)$ **B.** $(-3, 5)$ **C.** $(2, -1)$ **D .** $(-1, 2)$

42. Determine the range of the function f from the given graph on the right .



A.$[-2, 2]$ **B.** $[-2, 1]$

C.$[-1, 2]$ **D.** $[0, 2]$

43. Find the result of $\lim_{x\to 0} \frac{\frac{5}{2x+10} - \frac{1}{2}}{x}$. **A.** $\frac{5}{2}$ **B.** $-\frac{1}{20}$ **C.** $-\frac{1}{10}$ **D.** 0

44. Find the result of $\lim_{x\to 0} \frac{\sqrt{x+5}-\sqrt{5}}{x}$. **A.** $\frac{1}{\sqrt{10}}$ **B.** $2\sqrt{5}$ **C.** $\frac{-1}{\sqrt{5}}$ **D .** $\frac{1}{2\sqrt{5}}$

45. Which of the following functions has no vertical asymptote at $x = 2$?

A. $f(x) = \frac{x^2-4}{(x-2)^2}$ **B.** $f(x) = \frac{x+2}{x^2-4}$ **C.** $f(x) = \frac{x^2+4}{x^2-3x+2}$ **D .** $f(x) = \frac{x^2+x-6}{2x^2-8}$

46. Find the domain of the function $g \circ f$ when $f(x) = 4 - x^2$ and $g(x) = -\sqrt{x}$.

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

47. On which interval is the function $f(x) = x^{\frac{2}{3}} - 4$ decreasing ?

A. $]-\infty, 0[$ **B.** $]-\infty, 4[$ **C.** $]0, +\infty[$ **D.** None

48. If $f(x) = x^3$ then which of the following is equal to $\frac{f(x)-f(2)}{x-2}$?

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

49. Depending on the intermediate value theorem (IVT). If the function **f** is continuous between ($x = a$ and $x = b$) , then the equation $f(x) = 0$ has at least one root between two numbers **a** and **b** when the signs $f(a)$ *and* $f(b)$ are …….

A. Positive **B.** Negative **C.** Opposite **D.** None

50. On which interval is the function $f(x) = \frac{x-1}{x+1}$ convex ?

A. $]-1, 1[$ **B.** $]-\infty, -1[$ **C.** $]-1, +\infty[$ **D.** *None*