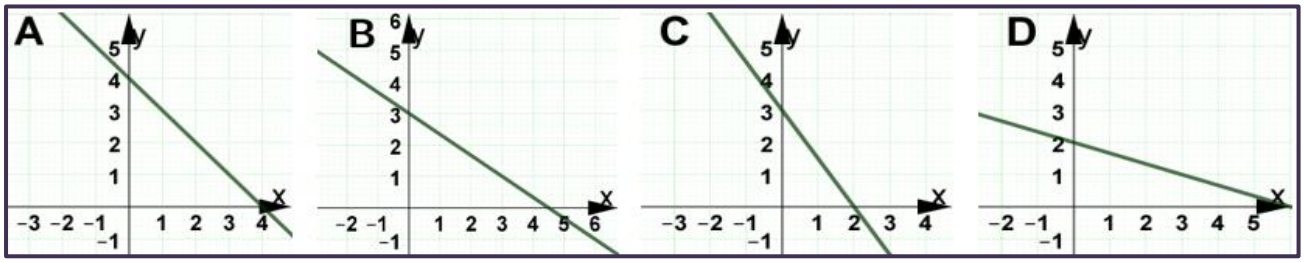
KURDISTAN REGION GOVERNMENT -IRAQ IN THE NAME OF ALLAH Time:3.5 hours
MINISTRY OF EDUCATION
HIGH COMMITTEE OF THE GENERAL EXAMINATIONS
وەڵامی نموونەی
General Examinations for Preparatory Stage \ 1 st Attempt
Study year (2024-2025) (Grade 12th scientific) Subject : Mathematics

Fingerprint

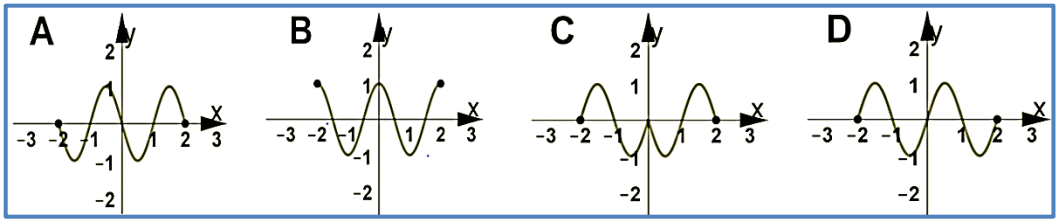
A

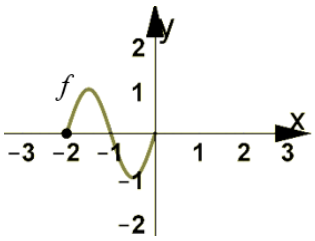
Choose the correct answer, two marks for each question

1. Sketch the graph of the line that passes through the point $(3, 1)$ and that is perpendicular to the line $3x - 2y = 7$.



2. The domain of the function shown in the figure is $-2 \le x \le 2$. Complete the missing part of the graph where the function satisfy the condition $f(-x) = -f(x)$.





3. Find the equation of the line that passes through the two points (1 , -2) and (3 , -2).

A) $y = -x - 1$ **B)** $y = x - 3$ **C)** $y = -x$ **D)** $y + 2 = 0$

4. The function $S(t) = -4.9t^2 + 49$ represents a model to determine the position of an object falling from a height of 49 meters after t seconds. Find the velocity of the object at $t = 5$.

A) -98 m/s **B)** -49 m/s **C)** -54 m/s **D)** -16 m/s

5. Find the y-intercept of the function $f(x) = -\sqrt{x^2 - 9} + 5$.

A) $(0, -9)$ **B)** $(0, 5)$ **C)** $(0, -4)$ **D)** None .

6. The domain of which of the following functions is $[-2, 2]$.

A) $f(x) = \frac{1}{x^2 - 4}$ **B)** $f(x) = \sqrt{x^2 - 4}$ **C)** $f(x) = -\sqrt{4 - x^2}$ **D)** $f(x) = 2\,sinx$

7. Determine the range of the function $f(x) = \begin{cases} 2x - 5 & x < 3 \\ 3 - x & x \ge 3 \end{cases}$

A) $]-\infty, 1[$ **B)** $]-\infty, 0[$ **C)** $[1, +\infty[$ **D)** $[0, +\infty[$

8. Find three functions f , g and h so that $k = fogoh$ and $k(x) = 2\sin(3x)$

A) $f(x) = \sin x$; $g(x) = 2x$; $h(x) = 3x$ **B)** $f(x) = 2x$; $g(x) = \sin x$; $h(x) = 3x$

C) $f(x) = \sin x$; $g(x) = 3$; $h(x) = 2x$ **D)** $f(x) = 2x$; $g(x) = 3x$; $h(x) = \sin x$

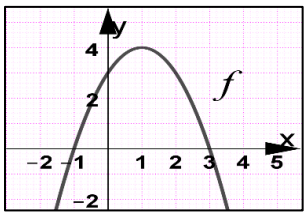
9. Which of the following group points are collinear ?

A) $(2, 2)$; $(3, -4)$; $(0, 7)$ **B)** $(0, 5)$; $(1, 1)$; $(2, -3)$

C) $(6, -1)$; $(2, 10)$; $(-1, 4)$ **D)** $(2, -3)$; $(4, -3)$; $(0, 1)$

10. The result of $\lim\limits_{x \to +\infty} \frac{3x}{2x - \sin 4x}$ is : **A)** $\frac{3}{4}$ **B)** $\frac{-3}{2}$ **C)** $\frac{3}{2}$ **D)** Does not exist .

11. Use the given graph on the right , to find the result of $f(-1)+2f'(1)$



A) 8 **B)** 4
C) 0 **D)** 7

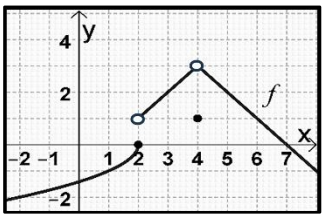
12. The result of $\lim_{x\to 0}\frac{\cos 2x\ \tan 2x}{4x}$ is : **A)** 0 **B)** $\frac{1}{2}$ **C)** 1 **D)** Does not exist .

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

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

15. The result of $\lim_{x\to 5}\frac{x^2-10x+25}{|x-5|}$ is : **A)** 0 **B)** 10 **C)** 50 **D)** Does not exist .

16. Use the given graph on the right ,
which of the following is false ?



A) $\lim_{x\to 2^-} f(x)=0$ **B)** $\lim_{x\to 2^+} f(x)=1$

C) $\lim_{x\to 4} f(x)=1$ **D)** $\lim_{x\to 3} f(x)=2$

17. The value of which of the following limits is equal to (4) .

A) $\lim_{x\to 0}\frac{\cos 4x}{x}$ **B)** $\lim_{x\to 0} 4\,ln(x+1)$ **C)** $\lim_{x\to \pi} 4\,e^{\sin x}$ **D)** $\lim_{x\to 4}\frac{x^2-16}{x-4}$

18. Which of the following functions that match at all value of x with function $f(x)=x-2$ except $x=-2$?

A) $g(x)=\frac{x^2+x-2}{x+2}$ **B)** $g(x)=\frac{|x+2|}{x+2}$ **C)** $g(x)=\frac{x^2+4}{x+2}$ **D)** $g(x)=\frac{x^2-4}{x+2}$

19. Which of the following functions is discontinuous at $x=-1$ and its discontinuity is removable.

A) $f(x)=\frac{|x+1|}{x+1}$ **B)** $f(x)=\frac{x^2-1}{(x+1)^2}$ **C)** $f(x)=\frac{2x^2+7x+5}{x+1}$ **D)** All of them .

20. Determine all the vertical asymptotes to the function $f(x)=\frac{\pi}{\cos \pi x}$.

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

21. Use the intermediate vale theorem (IVT) , Which of the following functions where $f(x)=0$ has a root between -1 and 2 ?

A) $f(x)=x^3-3x-5$ **B)** $f(x)=x^3+7x^2-2$ **C)** $f(x)=\frac{-3}{x-1}$ **D)** $f(x)=\cos \pi x$

22. Find the derivative of the function $f(x)=e^{(1+\ln x)}$.

A) $f'(x)=\frac{e^x}{x}$ **B)** $f'(x)=x\,e^x$ **C)** $f'(x)=e$ **D)** $f'(x)=e^x$

23. Find the value of k such that the line $y=4x-5$ is tangent to the graph of the function $f(x)=2x^2-kx+3$.

A) $\begin{cases} k=4 \\ k=-12 \end{cases}$ **B)** $\begin{cases} k=-4 \\ k=12 \end{cases}$ **C)** $\begin{cases} k=4 \\ k=12 \end{cases}$ **D)** $\begin{cases} k=-4 \\ k=-12 \end{cases}$

24. Find the second derivative of the function $f(x)=x\cos x$.

A) $f''(x)=-x\cos x-2\sin x$ **B)** $f''(x)=-x\sin x+2\cos x$
C) $f''(x)=-x\sin x-2\cos x$ **D)** $f''(x)=x\sin x+3\cos x$

25. If g and h are two differentiable functions and $f(x) = g(x)\,h(x)$ then find the result of $f'(2)$.

Knowing that $h(-x) = -h(x)$; $\lim_{\Delta x \to 0} \frac{h(-2+\Delta x)-h(-2)}{\Delta x} = -13$; $h(-2) = -10$

$g(-x) = g(x)$; $\lim_{x \to -2} \frac{g(x)-g(-2)}{x+2} = -6$; $g(-2) = 3$

A) -21 **B)** 21 **C)** -99 **D)** 99

26. Find the slope of the tangent line to the graph of the curve $y = 2\cos(\pi x - y)$ at the point $\left(\frac{1}{2}, 0\right)$. **A)** -2π **B)** $\frac{-1}{2\pi}$ **C)** 2π **D)** $\frac{1}{2\pi}$

27. Find the result of $\lim_{x \to 0} \frac{2\sqrt{1+\sin x}-2}{4x}$ (use L'Hôpital's rule) **A)** 4 **B)** 2 **C)** $\frac{1}{2}$ **D)** $\frac{1}{4}$

28. Assume that x and y are two differentiable functions of a variable t . If $3x^2 - 4y^2 = 8$ then find $\frac{dy}{dt}$ at the point $(2, -1)$. Knowing that $\frac{dx}{dt} = \frac{1}{4}$.

A) $\frac{3}{8}$ **B)** $\frac{1}{8}$ **C)** $\frac{-3}{8}$ **D)** $\frac{-1}{8}$

29. Find the value of a so that the function $f(x) = \begin{cases} \frac{x-3}{x^2-9} & x \neq 3 \\ 2a & x = 3 \end{cases}$ is continuous at $x = 3$.

A) 3 **B)** $\frac{1}{3}$ **C)** $\frac{1}{12}$ **D)** $\frac{1}{6}$

30. If the function $f(x) = \frac{2x-b}{ax+5}$ has a vertical asymptote at $x = \frac{-5}{3}$ and it has vanishes at $x = \frac{5}{2}$ then find the result of $3f(b) - 7f'(a)$. **A)** $\frac{-1}{7}$ **B)** $\frac{-3}{7}$ **C)** $\frac{-5}{28}$ **D)** $\frac{-25}{28}$

31. Which of the following is true for the function $f(x) = x^{\frac{3}{5}}$ at $x = 0$?

A) Has a vertical tangent at this point. **B)** The function is discontinuous at this point.

C) $f(0)$ is not defined . **D)** The function is differentiable at this point .

32. Find the critical value of the function $f(x) = \frac{e^x}{x}$.

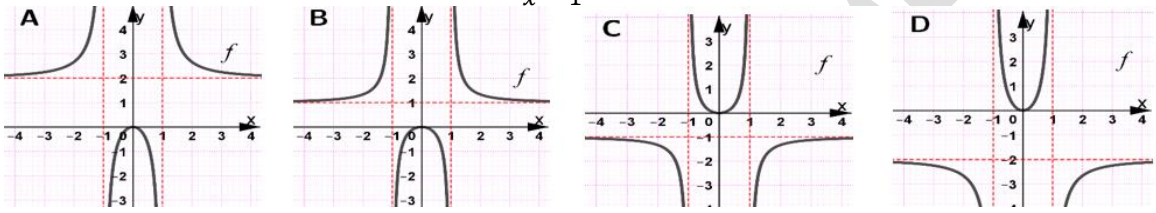
A) $x = 0$ **B)** $x = 1$ **C)** $x = -1$ **D)** None .

33. Find the distance between the line $3x + 4y = 10$ and a point that is local minimum of the function $f(x) = 2x^3 + 3x^2 - 12x$. **A)** 7 **B)** 12 **C)** 15 **D)** $\frac{64}{5}$

34. Determine the equation of the horizontal asymptote of the function $f(x) = \frac{4-3x^2}{2x^2+5}$.

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

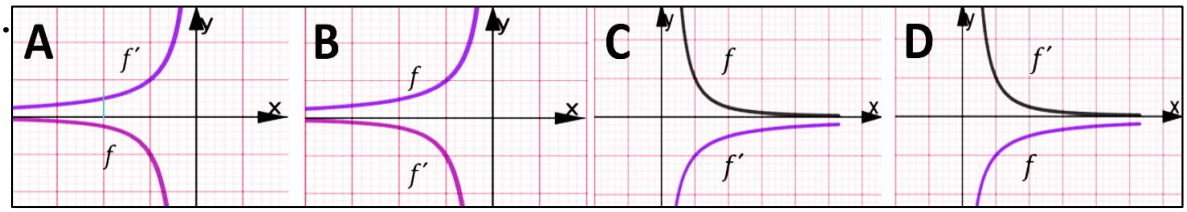
35. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x^2}{x^2-1}$.



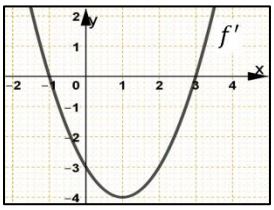
36. Find the interval on which the graph of the function $f(x) = x + \frac{9}{x}$ is concave .

A) $]-\infty, 0[$ **B)** $]0, +\infty[$ **C)** $]-\infty, -3[$ **D)** $]-3, +\infty[$

37. f is a function whose derivative is a decreasing function . Determine a graph for f and f' where $f'(x) > 0$.



38. The graph on the right shows the graph of the derivative of the function f. Which of the following statements is true ?



A) $f'(0) < f'(1)$ **B)** $f(0) < f(1)$

C) $f''(0) > f''(2)$ **D)** $f(1) > f(2)$

39. Find the interval on which the graph of the function $f(x) = \sin x - \cos x$ is increasing on the interval $]\,0\,, 2\pi\,[$.

A) $]\frac{\pi}{4}\,,\frac{5\pi}{4}[$ **B)** $]\frac{3\pi}{4}\,,\frac{7\pi}{4}[$ **C)** $]\,0\,,\frac{\pi}{4}[\,\cup\,]\frac{5\pi}{4}\,,2\pi[$ **D)** $]\,0\,,\frac{3\pi}{4}[\,\cup\,]\frac{7\pi}{4}\,,2\pi[$

40. The product of two positive numbers is (108) . Find the value where the sum of the first and three times of the second is a minimum . **A)** 72 **B)** 48 **C)** 36 **D)** 24

41. The result of $\int \frac{1-2\sin x}{3}\,dx$ is : **A)** $\frac{x-2\cos x}{3}+c$ **B)** $\frac{x+2\cos x}{3x}+c$ **C)** $\frac{x+2\cos x}{3}+c$ **D)** $\frac{x-2\cos x}{3x}+c$

42. The result of $\int_1^4 (x-1)^2\,dx$ is : **A)** 9 **B)** 27 **C)** $\frac{26}{3}$ **D)** 12

43. If $\int_1^5 f(x)\,dx = 3$ and $\int_3^1 f(x)\,dx = -5$ then find the result of $\int_5^3 [\,x + 2\,f(x)\,]\,dx$.

A) -24 **B)** -16 **C)** -8 **D)** -4

44. Determine the $\lim\limits_{x\to\,+\infty} \frac{(1-2x)^2-4x^2}{2x^2+1}$. **A)** 2 **B)** 0 **C)** $-\infty$ **D)** $+\infty$

45. Find the mean value of the function $f(x) = 3x^2 + e^x$ over the interval $[\,0\,,2\,]$.

A) $\frac{7+e}{2}$ **B)** $\frac{7+e^2}{2}$ **C)** $\frac{8+e}{2}$ **D)** $\frac{8+e^2}{2}$

46. Find the area of the region bound by the graph of the function $f(x) = 2\cos x$, the x-axis and the two lines $x = 0$ and $x = \frac{\pi}{2}$. **A)** 1 **B)** $\frac{3}{2}$ **C)** 2 **D)** $\frac{5}{2}$

47. If $g(x) = \int_0^x (\,3t^2 - 1\,)\,dt$,then the value of $g'(3)$ is : **A)** 18 **B)** 26 **C)** 27 **D)** 24

48. Find the x- coordinates of the points of the inflection of the function $f(x) = x^5 + 5x^4 - 5x + 1$

A) -3 only **B)** 0 only **C)** -3 and 0 **D)** 3 only

49. The result of $\int_0^2 x\,(x^2-1\,)^3\,dx$ is : **A)** $\frac{15}{8}$ **B)** $\frac{3}{8}$ **C)** $\frac{5}{2}$ **D)** 10

50. If $f'(x) = x\cos\frac{x}{2}$ then find the result of $f(\pi)$ knowing that $f(0) = 3$.

A) $\pi + 1$ **B)** $\pi - 1$ **C)** $2\pi + 1$ **D)** $2\pi - 1$