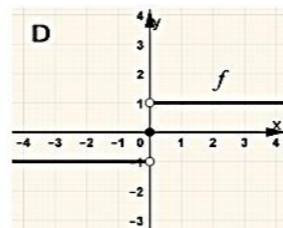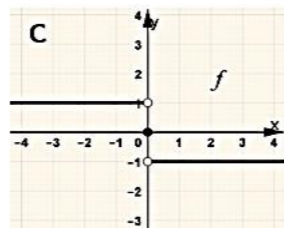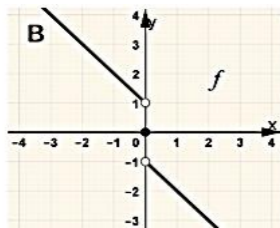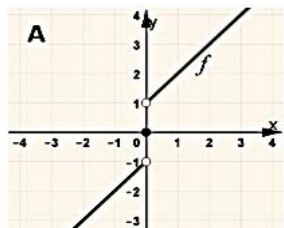### Choose the correct answer, two marks for each question.

1. Sketch the graph of the function $f(x) = \begin{cases} -1 & x < 0 \\ 0 & x = 0 \\ 1 & x > 0 \end{cases}$

2. If $g(x) = 3 - 2x^2$ and $f(x) = 2 - x$ then which of the following functions is an even function ?   **A)** $(f + g)(x)$ **B)** $(f - g)(x)$ **C)** $(fog)(x)$ **D)** $(gof)(x)$

3. Which of the following functions has no y −intercept ?
   A) $f(x) = |x - 2| + 4$ **B)** $f(x) = \frac{x+3}{x-4}$ **C)** $f(x) = -\ln(x + 4)$ **D)** $f(x) = \frac{1}{\sqrt{x-4}}$

4. Determine the range of the function $f(x) = \frac{5}{3 - x}$
   A) $R - \{0\}$ **B)** $R - \{3\}$ **C)** $R - \{-5\}$ **D)** $R - \{5\}$

5. Find the value of (a) so that the points $(a , 4)$, $\left(2 , \frac{11}{2}\right)$ and $(2a , 1)$ are collinear .
   A) $a = \frac{1}{2}$ **B)** $a = \frac{1}{4}$ **C)** $a = 2$ **D)** $a = 4$

6. Find the value of $(\sin x)$, where the rates of change of the two functions
   $f(x) = 8 \cos x$, $g(x) = \frac{-1}{\tan x}$ are equal.
   A) $\frac{1}{2}$ **B)** $\frac{1}{\sqrt{2}}$ **C)** $\frac{-1}{\sqrt{2}}$ **D)** $\frac{-1}{2}$

7. A company pays a truck driver (15 000) Dinar per day, for food and rest , and (300) Dinars for every kilometer he drives. How much does the company pay the driver if he drove (160 km)?
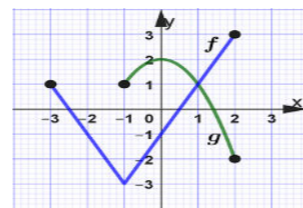   **A)** 40 000 Dinar   **B)** 63 000 Dinar   **C)** 75 000 Dinar   **D)** 48 000 Dinar

8. If $g(x) = \left(2x + f(x)\right)^{\frac{3}{2}}$,find the value of $g'(1)$ if you know that $f(1) = 2$ and $f(1) = 8 f'(1)$.
   A) $\frac{27}{4}$ **B)** $\frac{9}{4}$ **C)** $\frac{9}{2}$ **D)** $\frac{27}{2}$

9. If $f(x) = x - 1$ and $g(x) = \sqrt{x + 5}$ then find the value of x where $f(x) = g(x)$.
   A) $x = 4$ **B)** $x = -1$ **C)** $x = -1 \ and \ x = 4$ **D)** None .

10. Use the given graph on the right , which of the following is true ?

   A) The domain of the function f is: $[-3 , 3]$ **B)** $(fog)(2) = 1$

   C) The range of the function g is : $[-1 , 2]$ **D)** $(gof)(-3) = 1$

11. If $f(x) = \frac{-12}{x^2 - 4}$ and $g(x) = \frac{3}{x-2}$, then find the value of $\lim_{x \to 2}[f(x) + g(x)]$
   A) $\frac{1}{4}$ **B)** $\frac{3}{4}$ **C)** $\frac{9}{4}$ **D)** Does not exist

12. If $f(x) = 4 x^3 + 1$ then the result of $\lim_{x \to 1} \frac{f(x) - f(1)}{1 - x}$ is :
   A) -12 **B)** -4 **C)** 12 **D)** Does not exist

13. The result of $\lim_{x \to 1} \frac{x^2 - 1}{e^x - 1}$ is :   **A)** e^2 **B)** $\frac{2}{e}$ **C)** 0 **D)** Does not exist

14. The result of $\lim_{x \to 0} \frac{2 - 2 \cos (3x)}{6 x^2}$ is :   **A)** $\frac{3}{2}$ **B)** $\frac{1}{3}$ **C)** $\frac{7}{2}$ **D)** $\frac{1}{6}$
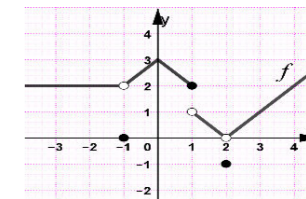
15. Find the vertical asymptote to the function $f(x) = \frac{x^2 - 9}{x - 3}$.
   A) $x = 3$ **B)** $x = -3$ **C)** $x = \mp 3$ **D)** None

16. Use the given graph on the right to find the result of
   $\lim_{x \to -1} f(x) - \frac{3}{2} \lim_{x \to 1^+} f(x)$
   A) 1 **B)** 0
   C) $\frac{1}{2}$ **D)** $\frac{-3}{2}$

17. Determine all the points of discontinuous of the function $f(x) = \sqrt{\frac{x+2}{x}}$
   A) $[-2 , 0]$ **B)** $]-2 , 0[$ **C)** $]-2 , 0]$ **D)** $[-2 , 0[$

18. If the function $f(x) = \begin{cases} 2x - 3 & -2 < x < 3 \\ x^2 + b x + c & |2x - 1| \geq 5 \end{cases}$ has no points of discontinuity, then find the value of : $(3b - 2c)$
   A) 16 **B)** 19 **C)** 21 **D)** 31

19. If $f'(-1) = \lim_{\Delta x \to 0} \frac{[-2 (-1+\Delta x)^2 - 3] + 5}{\Delta x}$, then find the result of $2 f'(-1)$
   A) -1 **B)** 5 **C)** -5 **D)** 8

20. Which of the following is false ?
   A) The distance between the point $(-4 , -5)$ and the line $y = 3$ is equals 8 .
   B) Every antiderivative of a polynomial function of degree n is a polynomial function of degree $n + 1$
   C) If a function is differentiable at some point , then it is continuous at that point .
   D) Every rational function has vertical asymptotes .

21. Find the derivative of the function $f(x) = \frac{\ln x}{x}$.
   A) $f'(x) = \frac{1 - \ln x}{x^2}$ **B)** $f'(x) = \frac{1 + \ln x}{x^2}$ **C)** $f'(x) = \frac{\ln x - 1}{x^2}$ **D)** $f'(x) = \frac{\ln x}{x^2}$

22. Find the critical value of the function $f(x) = x e^{2x}$.
   A) $x = \frac{1}{2}$ **B)** $x = \frac{-1}{2}$ **C)** $x = \frac{3}{2}$ **D)** $x = \frac{-3}{2}$

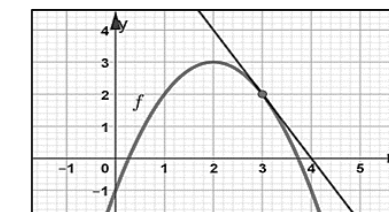**23.** Find the second derivative of the function $f(x) = x + 32x^{-1}$ at $x = -4$.
   A) -1 **B)** 1 **C)** 4 **D)** -4

24. If $y^3 + xy - 3 \cos x = 5$ then find the value of $\frac{dy}{dx}$ at the point $(0 , 2)$.
   A) $\frac{-1}{6}$ **B)** $\frac{-5}{6}$ **C)** $\frac{5}{6}$ **D)** $\frac{-1}{12}$

25. Use the given graph on the right to find the result of $4 f(3) - 3 f'(3)$
   A) 8 **B)** 12 **C)** 14 **D)** 18

26. Find the result of $\lim_{x \to 1} \frac{3 x^2 - 3}{\ln x^3}$. (Use L'Hôpital's rule)
   A) 1 **B)** 2 **C)** 3 **D)** 6

27. If the equation of the tangent line to the graph of the function $f(x) = \frac{1}{\sqrt{x-1}}$ is parallel to the line $x + by = 13$ at $x = 5$ then find the value of b.

A) 4   B) 8   C) 12   D) 16

28. The area of a circle increases an average of $36\pi \ cm^2/min$, while its circumference increases $18\pi \ cm/min$. What is the length of the radius of this circle?

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

29. In a fireworks festival, a rocket lunched upward from the height of 5 feet of the ground, at an initial velocity of 144 feet per second. What is the velocity of the rocket when it reaches 133 feet downward?

A) $-128 \ ft/s$ B) $-112 \ ft/s$ C) $-98 \ ft/s$ D) $-64 \ ft/s$

30. Determine the equation of the slant asymptote to the graph of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$

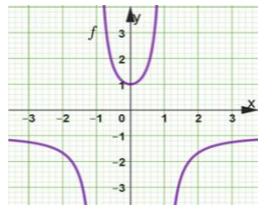A) $y = 4x - 1$ B) $y = 4x + 1$ C) $y = 4x - 7$ D) $y = 4x + 7$

31. Determine the interval on which the function $f(x) = 2\cos(\pi x)$ is decreasing? where $\frac{1}{2} < x < \frac{5}{2}$

A) $]\frac{1}{2}, 1[\cup]2, \frac{5}{2}[$ B) $]1, 2[$ C) $]\frac{3}{2}, 2[$ D) None

32. At which value of x the graph of the function $f(x) = -(x+6)^4$ has a point of inflection?

A) $x = 6$ B) $x = -6$ C) $x = -4$ D) None

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

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

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

34. Let $a < 0$. The graph of the function $f(x) = ax^3 + 3x^2 + 4x + 5$ is concave on the interval:

A) $]-\infty, \frac{1}{a}[$ B) $]-\infty, \frac{-1}{a}[$ C) $]\frac{1}{a}, +\infty[$ D) $]\frac{-1}{a}, +\infty[$
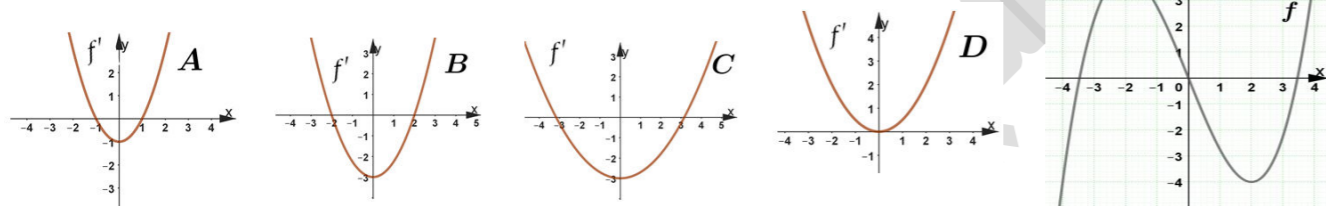
35. Which of the following is true?

A) $\lim\limits_{x\to+\infty} \frac{2x^2-x-1}{2-x} = +\infty$ B) $\lim\limits_{x\to-\infty} \frac{6x}{\cos x + 3x} = 2$

C) $\lim\limits_{x\to+\infty} \frac{(3-2x)^2}{3x^2+1} = \frac{-2}{3}$ D) $\lim\limits_{x\to-\infty} \frac{x}{2\sin x} = \frac{1}{2}$

36. What is the maximum area of a right triangle whose hypotenuse measures (16 cm).

A) $32 \ cm^2$ B) $64 \ cm^2$ C) $128 \ cm^2$ D) $256 \ cm^2$

37. The graph on the right shows the curve of the function f, which of the following graphs is the graph of f'?

38. The result of $\int \frac{-2}{3x\sqrt{x}} dx$ is:

A) $\frac{-4}{3x^2\sqrt{x}} + c$ B) $\frac{4}{3x^2\sqrt{x}} + c$ C) $\frac{-4}{3\sqrt{x}} + c$ D) $\frac{4}{3\sqrt{x}} + c$

39. The result of which of the following is equal to -2?

A) $\int_1^e 2\ln x \, dx$ B) $\int_{-1}^1 \frac{1}{x^2} dx$ C) $\int_1^2 \frac{-4}{x^2} dx$ D) $\int_0^2 \sqrt{x} \, dx$

40. If $f'(x) = 2\sin x + 3\cos x$, then find the value of $f(\pi)$. knowing that $f(0) = 2$.
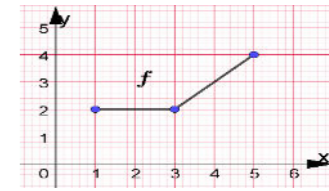
A) - 6   B) - 2   C) 6   D) 4

41. The result of $\int_0^3 (3 - |x-3|) dx$ is: A) 9   B) $\frac{9}{2}$ C) $\frac{27}{2}$ D) $\frac{21}{2}$

42. Find the area of the region bounded by the graph of the two functions $f(x) = x + 1$ and $g(x) = (x-1)^2$.   A) $\frac{5}{2}$ B) $\frac{7}{2}$ C) $\frac{9}{2}$ D) $\frac{13}{2}$

43. Use the given graph on the right to find the mean value of the function f over the interval $[1, 5]$.

A) 2   B) $\frac{5}{2}$

C) $\frac{11}{4}$ D) 3

44. The result of $\int_1^4 x \, e^x \, dx$ is:

A) $3 \, e^4$ B) $\frac{e^4}{3}$ C) $3(e^4 - 1)$ D) $\frac{e^4-1}{3}$

45. Find the volume of the solid formed by revolving the region bounded by the graph of the functions $y = \sqrt{x}$, $y = 1$, $x = 0$, around the $x - axis$.

A) $\frac{\pi}{2}$ B) $\frac{\pi}{3}$ C) $\frac{\pi}{4}$ D) $\frac{\pi}{6}$

46. If $f(x) = ax^3 + bx^2$, where a and b are two real numbers. Find the value of $f(-3)$, knowing that the function has a point of inflection at point $(1, 4)$.

A) 100   B) 108   C) 112   D) 0

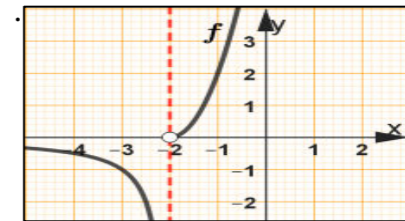**47.** If $f(x) = x^2 + 6x$ then find the value of $f(b-1)$.

A) $(b-2)(b-3)$ B) $(b-5)(b-1)$ C) $(b-5)(b+1)$ D) $(b+5)(b-1)$

48. If $\int_a^b f(x) dx = a + 2b$ then the value of integral $\int_a^b [f(x) - 4] dx$ is:

A) $5b - 2a$ B) $5a - 2b$ C) $5a - 4b$ D) $4a - 5b$

49. Find the result of $\lim\limits_{x\to 2} \frac{2-x}{\sqrt{x+3} - \sqrt{5}}$.   A) $\frac{1}{2\sqrt{5}}$ B) $\frac{-1}{2\sqrt{5}}$ C) $2\sqrt{5}$ D) $-2\sqrt{5}$

50. Use the given graph, to find the result of $\lim\limits_{x\to-2^+} f(x)$.

A) $+\infty$ B) 0

C) $-\infty$ D) -2