1. The expression $ab + 3c - 3b - ac$ is equal to

(A) $(a - 3)(b - c)$
(B) $(a + 3)(b - c)$
(C) $(a - 3)(b + c)$
(D) $(a + 3)(c - b)$

2. The linear factor of $x^3 - 3x^2 - 3x - 4$ is

(A) $x - 1$
(B) $x - 2$
(C) $x + 2$
(D) $x - 4$

6-X-2X^2

3. Given that $f(x) = 3 - x - 2x^2$ is less than or equal to k, where $k \in \mathbb{R}$, then k is equal to

(A) $-\frac{49}{8}$

(B) $-\frac{1}{4}$

(C) $\frac{1}{4}$

(D) $\frac{49}{8}$

4. Given that $f(x) = 1 - 4x - 2x^2$, then $f(x)$ can be expressed in the form

(A) $2(x + 1)^2 - 3$

(B) $3 - 2(x - 1)^2$

(C) $3 - 2(x + 1)^2$

(D) $3 - (2x + 1)^2$

5. A quadratic equation is such that the sum of its roots is $-\frac{2}{3}$ and the product of its roots is $\frac{3}{4}$. The quadratic equation is

(A) $12x^2 + 8x + 9 = 0$
(B) $12x^2 - 8x - 9 = 0$
(C) $12x^2 - 8x + 9 = 0$
(D) $12x^2 + 8x - 9 = 0$

6. Given that $x > 0$, the set of values of x for which $x - 2 < \frac{15}{x}$ is

(A) $\{x: x > 0 \cup x > 5\}$

(B) $\{x: 0 < x < 5\}$

(C) $\{x: x > 5\}$

(D) $\{x: x < 5\}$

7. Given that $f(x) = 13x - 6 - 2x^2$, the values of x for which $f(x) < 0$ are

(A) $x > \frac{1}{2}$ and $x > 6$

(B) $x < \frac{1}{2}$ and $x > 6$

(C) $x < -\frac{1}{2}$ and $x > 6$

(D) $x > \frac{1}{2}$ and $x < 6$

8. If $f(x) = \frac{1}{8}x^3$, $x \in \mathbb{R}$ and $-2 \leq x \leq 4$, then

(A) $-8 \leq f(x) \leq 64$

(B) $8 \leq f(x) \leq 64$

(C) $-1 \leq f(x) \leq 8$

(D) $-2 \leq f(x) \leq 4$

9. If $f: x \to 2\left(\frac{x}{3}+5\right)$, then $f^{-1}(x)$ is equal to

(A) $3\left(\frac{x}{2}-5\right)$

(B) $3\left(\frac{x}{2}+5\right)$

(C) $\frac{1}{3}\left(\frac{x}{2}-5\right)$

(D) $\frac{3(x-2)}{5}$

10. If $f(x)=\frac{4x+1}{x-2}$, $x \neq 2$, $x \in R$,

then $ff(x)=$

(A) $\frac{2x-1}{-3-x}$, $x \neq -3$, $x \in R$

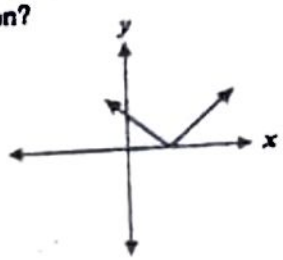
(B) $\frac{2x-1}{5-x}$, $x \neq 5$, $x \in R$

(C) $\left(\frac{x+2}{x-2}\right)^2$, $x \neq 2$, $x \in R$

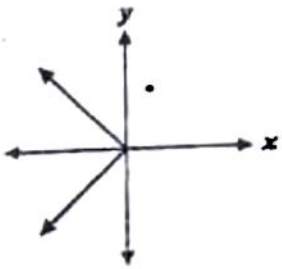
(D) $\frac{2x-1}{3x+5}$, $x \neq -\frac{5}{3}$, $x \in R$

11. Which of the following graphs depicts a function?

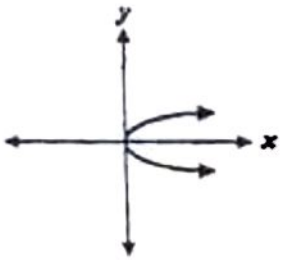
(A)



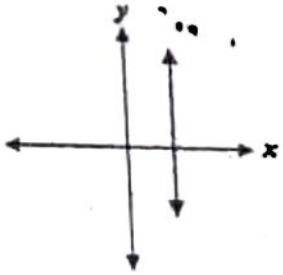
(B)



(C)



(D)



12. $\sqrt[n]{3 \times 27^m}$ is equal to

(A) $3^{\frac{4m}{n}}$

(B) 3^{m+3m}

(C) $\sqrt[n]{81^{3m}}$

(D) $3^{\frac{3m+1}{n}}$

13. The value of x for which $9^{x+1} = 3$ is

(A) $-\frac{3}{2}$

(B) $-\frac{1}{2}$

(C) $\frac{3}{2}$

(D) $\frac{5}{2}$

14. Given that $\log_2 x^3 = 6$, then the value of x is

(A) 2
(B) 4
(C) 8
(D) 64

15. The value of $\sqrt{18} + \sqrt{50}$ is

(A) $34\sqrt{2}$

(B) $6\sqrt{15}$

(C) $8\sqrt{2}$

(D) $\sqrt{68}$

16. The value of x for which $3^{x+2} + 3^x = 90$ is

(A) $\frac{1}{2}\left(\frac{\log 90}{\log 3} - 2\right)$

(B) 2

(C) 44

(D) $\left(\frac{\log 10}{\log 3}\right)$

17. The series $-2 + \frac{4}{3} - \frac{8}{9} + \ldots$ converges to the limit

(A) -6

(B) 6

(C) $-\frac{6}{5}$

(D) $\frac{6}{5}$

18. What is the sum of the ODD integers between 10 and 50?

(A) 60
(B) 600
(C) 630
(D) 1960

19. The common ratio of the geometric sequence 8, 12, 18, . . . is

(A) $\frac{1}{2}$

(B) $\frac{2}{3}$

(C) $\frac{3}{4}$

(D) $\frac{3}{2}$

20. A sequence of positive integers $\{U_n\}$ is defined by $U_n = 3\left(\frac{1}{2}\right)^{n-1}$. The 10th term of the sequence is given by

(A) $-\frac{19\,683}{512}$

(B) $\frac{3}{256}$

(C) $\frac{3}{512}$

(D) $\frac{3}{1000}$

21. The point (2, 3) is at one end of a diameter of a circle whose equation is

$x^2 + y^2 - 10x + 2y + 1 = 0.$

The coordinates of the other end of the diameter are

(A) (8, −1)
(B) (8, −5)
(C) (−12, −1)
(D) (−12, −5)

22. The line through the points Q(h, 2) and R(4, 8) is parallel to the line with equation $2x + y - 10 = 0$. The value of h is

(A) 1
(B) 2
(C) −7
(D) 7

23. The line $y = 2x - 7$ and the line $x + 3y = 7$ intersect at the point

(A) (4, 1)
(B) (8, 6)
(C) (−5, 4)
(D) (0, −7)

24. The vectors **i** and **j** represent 1 km/h east and north respectively. A man sails a boat on a lake such that the velocity is $-\mathbf{i} + 2\mathbf{j}$ when there is no current. If there is a current of $3\mathbf{i}$, then the resultant velocity, **v**, is given by

(A) $2\mathbf{i} + 2\mathbf{j}$ km/h
(B) $4\mathbf{i} - 2\mathbf{j}$ km/h
(C) $-4\mathbf{i} + 2\mathbf{j}$ km/h
(D) $-4\mathbf{i} - 2\mathbf{j}$ km/h

25. The vector a is given as $5\mathbf{i} + 12\mathbf{j}$. A unit vector parallel to a is

(A) $15\mathbf{i} + 36\mathbf{j}$
(B) $195\mathbf{i} + 468\mathbf{j}$
(C) $\frac{1}{13}(5\mathbf{i} + 12\mathbf{j})$
(D) $\frac{3}{13}(5\mathbf{i} + 12\mathbf{j})$

26. The position vector of two points A and B relative to an origin O are given by $\overrightarrow{OA} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$ and $\overrightarrow{OB} = \begin{pmatrix} 8 \\ 5 \end{pmatrix}$ respectively.

The modulus of $\overrightarrow{AB}$ and the angle $\overrightarrow{AB}$ makes with the x-axis respectively are

(A) modulus = 10, angle = 45°
(B) modulus = 10, angle = 30°
(C) modulus = $\sqrt{50}$, angle = 45°
(D) modulus = $\sqrt{50}$, angle = 90°

27. The trigonometrical expression $\frac{\sin x}{1-\cos x} + \frac{\sin x}{1+\cos x}$ is identical to

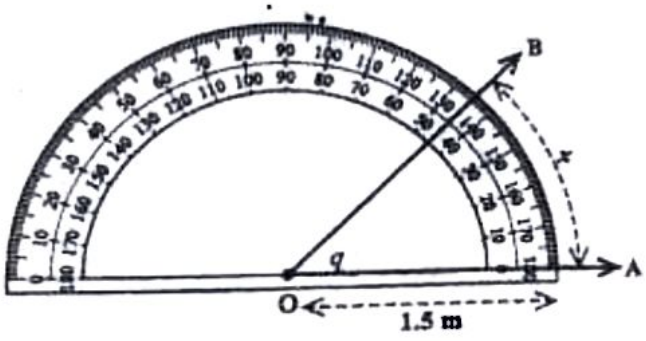
(A) $2 \sin x$

(B) $2 \tan x$

(C) $\tan^2 x$

(D) $\frac{2}{\sin x}$

Item 28 refers to the following protractor which represents half of a circle. The protractor has a radius of 1.5 metres and the angle AOB measures 45°.



28. What is the arc length, x, in metres, along the outer edge of the protractor?

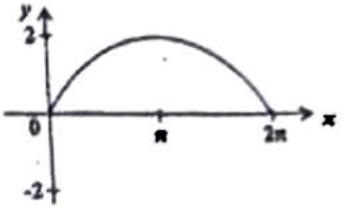
(A) $\frac{\pi}{4}$

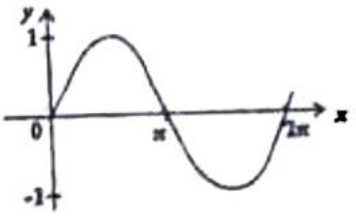
(B) $\frac{3\pi}{8}$

(C) $\frac{3\pi}{4}$

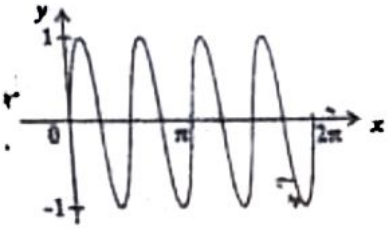
(D) $\frac{\pi}{6}$

29. The graph of $y = \sin 2x$ is

(A)


(B)


(C)


(D)


30. If $\sin (x + 20°) = \cos x$, then the value of x is

(A) 35°
(B) 45°
(C) 55°
(D) 70°

37. $\frac{d}{dx}\left(\frac{2x-1}{5-x}\right) =$

(A) $\frac{9}{(5-x)^2}$

(B) $\frac{-9-4x}{(5-x)^2}$

(C) $-\frac{9}{(5-x)^2}$

(D) $\frac{9-4x}{(5-x)^2}$

38. Given $y = 2x^2 + 3\cos x$, then $\frac{dy}{dx} =$

(A) $x + \sin x$
(B) $x - \sin x$
(C) $4x - 3\sin x$
(D) $4x + 3\sin x$

39. The curve C with equation $y = f(x)$ has a stationary point at (–2, 5).
If $f''(x) = x^4 - 15$, then (–2, 5) is

(A) a vertex
(B) an intercept
(C) a minimum turning point
(D) a maximum turning point

40. $\int_0^2 (3x+4)^3\,dx =$

(A) 812 units^2
(B) 821 units^2
(C) 830 units^2
(D) 854⅔ units^2

41. The solution to $\int_{-1}^{-1} \frac{1}{(5x-2)^2}\,dx$ is

(A) $\frac{1}{35} - \frac{1}{110}$

(B) $\frac{1}{35} + \frac{1}{110}$

(C) $-\frac{1}{35} - \frac{1}{110}$

(D) $-\frac{1}{35} + \frac{1}{110}$

42. $\int (2x-4)^3\,dx =$

(A) $(2x-4)^4 + k$

(B) $\frac{(2x-4)^4}{2} + k$

(C) $\frac{(2x-4)^2}{8} + k$

(D) $\frac{(2x-4)^4}{8} + k$

43. A curve C passes through the point $(2, -5)$. The gradient of the curve at the point (x, y) is given by $\frac{dy}{dx} = 7 - x^3$. The equation of the curve is

(A) $y = 7x - \frac{1}{4}x^4 - 15$

(B) $y = 7x - 3x^2 - 7$

(C) $y = -3x^2 + 7$

(D) $y = 7 - x^3$

44. If $\int_1^4 f(x)dx = 6$, then $\int_1^4 4f(x)dx + 5 =$

(A) 9
(B) 11
(C) 29
(D) 44

45. $\int(\cos x - 2\sin x)dx =$

(A) $-\cos x + \sin x + c$
(B) $\cos x - 2\sin x + c$
(C) $\cos x - \sin x + c$
(D) $2\cos x + \sin x + c$