

SECTION - A

I. Each questions carries 1 mark.

(1 x 6 = 6)

1. Find the equation for the ellipse that satisfies the conditions:
Ends of major axis $(\pm 3, 0)$, ends of minor axis $(0, \pm 2)$.

2. Evaluate $\lim_{x \rightarrow 0} \frac{18^x - 2^x - 9^x + 1}{x^2}$ OR Evaluate $\lim_{x \rightarrow \frac{\pi}{2}} \frac{a^{\cot x} - a^{\cos x}}{\cot x - \cos x}$.

3. If for $f(x) = \lambda x^2 + \mu x + 12$, $f'(4) = 15$ and $f'(2) = 11$, then find λ and μ .
Where $f'(x)$ is the derivative of $f(x)$ with respect to x .

4. In the binomial expansion of $(a - b)^n$, $n \geq 5$, the sum of 5th and 6th terms is zero,
prove that $\frac{a}{b} = \frac{n-4}{5}$. OR

If co-efficients of $(2r + 4)^{\text{th}}$ term and $(r - 2)^{\text{th}}$ term in $(1 + x)^{18}$ are equal, find r .

5. Find the equation of the circle concentric with $x^2 + y^2 - 4x - 6y - 3 = 0$ and which touches y -axis.

6. Solve $4 \cot^2 \theta = 3 \operatorname{cosec}^2 \theta$.

SECTION - B

II. Each question carries 4 marks.

(4 x 5 = 20)

7. Solve $\tan^2 \theta + (1 - \sqrt{3}) \tan \theta - \sqrt{3} = 0$

8. What are the points on the y -axis whose distance from the line $\frac{x}{3} + \frac{y}{4} = 1$ is 4 units.

OR

Find the direction in which a st. line must be drawn through the point $(1, 2)$ so that its point of intersection with the line $x + y = 4$ may be at a distance of $\frac{\sqrt{6}}{3}$ units from this point.

9. Find the equation of a circle of radius 5 which lies within the circle $x^2 + y^2 + 14x + 10y - 26 = 0$ and which touches the given circle at the point $(-1, 3)$.

OR

Find the equation of the circle whose centre is $(3, 4)$ and which touches the line $5x + 12y = 4$.

10. Differentiate $\tan\sqrt{x}$ w.r.t 'x' from the first principle
OR

Find $\frac{dy}{dx}$ if $y = \sin^3\{\log(a^x - \sqrt{x})\}$

11. If the third term in the expansion of $\left(\frac{1}{x} + x^{\log_{10} x}\right)^5$ is 1000, find the value of x.

OR

Find the middle term(s) in the expansion of $\left(3x - \frac{x^3}{6}\right)^7$.

SECTION - C

III. Each question carries 6 marks.

(6 x 4 = 24)

12. Find the equation of the parabola whose focus is (4, -3) and whose vertex is (4,1)

OR

Find the focus, directrix, Latus rectum of the ellipse $7x^2 + 7y^2 + 2xy + 10x - 10y + 7 = 0$.

13. A circle has radius 3 units and its centre lies on the line $y = x - 1$. Find the equation of the circle if it passed through (7, 3)

14. By using Binomial theorem that $9^{n+1} - 8n - 9$ is divisible by 64, where n is a positive integer.

OR

Find a, b and n in the expansion of $(a + b)^n$, if the first three terms of the expansion are 729, 7290 and 30375 respectively.

15. (a) If α and β be the roots of $ax^2 + bx + c = 0$, then prove that

$$\lim_{x \rightarrow \alpha} \frac{1 - \cos(ax^2 + bx + c)}{(x - \alpha)^2} = \frac{a^2}{2}(\alpha - \beta)^2 \quad \text{OR} \quad \lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^3}$$

(b) Evaluate $\lim_{x \rightarrow 0} \left\{ \frac{p^x + q^x + r^x}{3} \right\}^{\frac{2}{x}}$, $p, q, r > 0$.

OR

$$\lim_{x \rightarrow 0} \frac{5^x - 1}{\sqrt{x+4} - 2}$$