

Conic Section: Parabola - Class XI

Past Year JEE Questions

Questions

Question: 01

The centre of the circle passing through the point (0, 1) and touching the parabola

$y = x^2$ at the point (2, 4) is :

- A. $(\frac{6}{5}, \frac{53}{10})$
- B. $(\frac{3}{10}, \frac{16}{5})$
- C. $(-\frac{53}{10}, \frac{16}{5})$
- D. $(-\frac{16}{5}, \frac{53}{10})$

Solutions

Solution: 01

Explanation

Circle passes through A(0, 1) and B(2, 4).

$$y = x^2$$

$$\Rightarrow \left. \frac{dy}{dx} \right|_B = 4$$

tangent at (2,4) is

$$(y - 4) = 4(x - 2)$$

$$4x - y - 4 = 0$$

Equation of circle

$$(x - 2)^2 + (y - 4)^2 + \lambda(4x - y - 4) = 0$$

Passing through (0,1)

$$\therefore 4 + 9 + \lambda(-5) = 0$$

$$\Rightarrow \lambda = \frac{13}{5}$$

\therefore Circle is

$$x^2 - 4x + 4 + y^2 - 8y + 16 + \frac{13}{5}[4x - y - 4] = 0$$

$$\Rightarrow x^2 + y^2 + \left(\frac{52}{5} - 4\right)x - \left(8 + \frac{13}{5}\right)y + 20 - \frac{52}{5} = 0$$

$$\Rightarrow x^2 + y^2 + \frac{32}{5}x - \frac{53}{5}y + \frac{48}{5} = 0$$

∴ Centre is $(\frac{-16}{5}, \frac{53}{10})$