## Tangents and Normals Ex 16.1 Q8

The given equation of the curve is

$$y = x^2 \qquad \text{---(i)}$$

∴ Slope of tangent to (i) is

$$\frac{dy}{dx} = 2x \qquad \text{---(ii)}$$

According to the question

$$\frac{dy}{dx} = x \qquad \text{---(iii)} \qquad \qquad [\text{Slope = x-coordinate}]$$

From (ii) and (iii)

$$2x = x$$
$$\Rightarrow \quad x = 0 \ \& \ y = 0$$

Thus, the required point is $(0, 0)$

## Tangents and Normals Ex 16.1 Q9

The given equation of the curve is

$$x^2 + y^2 - 2x - 4y + 1 = 0 \qquad \text{---(i)}$$

Differentiating with respect is $x$, we get

$$2x + 2y \frac{dy}{dx} - 2 - 4 \frac{dy}{dx} = 0$$

$$\Rightarrow \quad \frac{dy}{dx}(2y - 4) = 2 - 2x$$

$$\Rightarrow \quad \frac{dy}{dx} = \frac{2(1-x)}{2(y-2)} \qquad \text{---(ii)}$$

According to the question the tangent is parallel to $x$-axis, so $\theta = 0°$

∴ $\qquad$ Slope $= \tan\theta = \tan 0° = 0 \qquad \qquad \text{---(iii)}$

From (ii) and (iii), we get

$$\frac{1-x}{y-2} = 0$$

$$\Rightarrow \quad 1 - x = 0$$

$$\Rightarrow \quad x = 1$$

∴ from (i)

$$y = 0, 4$$

Thus, the points are $(1, 0)$ and $(1, 4)$

## Tangents and Normals Ex 16.1 Q10

The given equation of curve is

$$y = x^2 \qquad\qquad\qquad\qquad \text{---(i)}$$

$$\therefore \quad \text{Slope} = \frac{dy}{dx} = 2x \qquad\qquad \text{---(ii)}$$

As per question

$$\text{slope} = \tan 45° = 1 \qquad\qquad \text{---(iii)}$$

From (ii) and (iii), we have

$$2x = 1$$

$$\Rightarrow \quad x = \frac{1}{2}$$

$\therefore$ From (i)

$$y = \frac{1}{4}$$

Thus, the required point is

$$\left(\frac{1}{2}, \ \frac{1}{4}\right)$$

Tangents and Normals Ex 16.1 Q11
The given equation of the curve is

$$y = 3x^2 - 9x + 8 \qquad\qquad \text{---(i)}$$

$$\text{Slope} = \frac{dy}{dx} = 6x - 9 \qquad\qquad \text{---(ii)}$$

As per question
   The tangent is equally inclined to the axes

$$\therefore \qquad \theta = \frac{\pi}{4} \text{ or } \frac{-\pi}{4}$$

$\therefore$  Slope $= \tan\theta$

$$= \tan\frac{\pi}{4} \text{ or } \tan\left(\frac{-\pi}{4}\right)$$

$$= 1 \text{ or } -1 \qquad\qquad \text{---(iii)}$$

From (ii) and (iii), we have,

$$6x - 9 = 1 \qquad \text{or} \qquad 6x - 9 = -1$$

$$\Rightarrow \quad x = \frac{5}{3} \qquad \text{or} \qquad x = \frac{4}{3}$$

So, from (i)

$$y = \frac{4}{3} \qquad \text{or} \qquad y = \frac{4}{3}$$

Thus, the points are

$$\left(\frac{5}{3}, \ \frac{4}{3}\right) \text{ or } \left(\frac{4}{3}, \ \frac{4}{3}\right)$$

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