Tangents and Normals Ex 16.1 Q12

The given equation are

$$y = 2x^2 - x + 1 \qquad ---(i)$$

$$y = 3x + 4 \qquad ---(ii)$$

Slope to (i) is

$$\frac{dy}{dx} = 4x - 1 \qquad ---(iii)$$

Slope to (ii) is

$$\frac{dy}{dx} = 3 \qquad ---(iv)$$

According to the question

$$4x - 1 = 3$$

$$\Rightarrow \quad x = 1$$

Thus from (i)

$$y = 2$$

Hence, the point is $(1, 2)$.

Tangents and Normals Ex 16.1 Q13

The given equation of curve is

$$y = 3x^2 + 4 \qquad ---(i)$$

$$\text{Slope} = m_1 = \frac{dy}{dx} = 6x \qquad ---(ii)$$

Now,

The given slope $m_2 = \frac{-1}{6}$

We have,

tangent to (i) is perpendicular to the tangent whose slope is $\frac{-1}{6}$

$$\therefore \quad m_1 \times m_2 = -1$$

$$\Rightarrow \quad 6x \times \frac{-1}{6} = -1$$

$$\Rightarrow \quad x = 1$$

From (i)

$$y = 7$$

Thus, the required point is $(1, 7)$.

Tangents and Normals Ex 16.1 Q14

The given equation of curve and the line is

$$x^2 + y^2 = 13 \qquad \text{---(i)}$$

and $$2x + 3y = 7 \qquad \text{---(ii)}$$

Slope = m_1 for (i)

$$m_1 = \frac{dy}{dx} = \frac{-x}{y} \qquad \text{---(iii)}$$

Slope = m_2 for (ii)

$$m_2 = \frac{dy}{dx} = \frac{-2}{3} \qquad \text{---(iv)}$$

According to the question

$$m_1 = m_2$$

$$\Rightarrow \quad \frac{-x}{y} = \frac{-2}{3}$$

$$\Rightarrow \quad x = \frac{2}{3}y$$

From (i)

$$\frac{4}{9}y^2 + y^2 = 13$$

$$\Rightarrow \quad \frac{13y^2}{9} = 13$$

$$\Rightarrow \quad y = \pm 3$$

$$\therefore \quad x = \pm 2$$

Thus, the points are $(2,3)$ and $(-2,-3)$.

Tangents and Normals Ex 16.1 Q15

The given equation of the curve is

$$2a^2y = x^3 - 3ax^2 \qquad \text{---(i)}$$

Differentiating with respect to x, we get

$$2a^2\frac{dy}{dx} = 3x^2 - 6ax$$

$$\therefore \quad \text{Slope } m_1 = \frac{dy}{dx} = \frac{1}{2a^2}\left[3x^2 - 6ax\right] \qquad \text{---(ii)}$$

Also,

$$\text{Slope } m_2 = \frac{dy}{dx} = \tan\theta$$

$$= \tan 0° = 0 \qquad [\because \text{Slope is parallel to } x\text{-axis}]$$

$$\therefore \quad m_1 = m_2$$

$$\Rightarrow \quad \frac{1}{2a^2}\left[3x^2 - 6ax\right] = 0$$

$$\Rightarrow \quad 3x\left[x - 2a\right] = 0$$

$$\Rightarrow \quad x = 0 \text{ or } 2a$$

$\therefore$ From (i)

$$y = 0 \text{ or } -2a$$

Thus, the required points are $(0,0)$ or $(2a,-2a)$.

*********** END **********