Tangents and Normals Ex 16.2 Q8

The given equations are

$y^2 = ax^3 + b$ ---(i)

$y = 4x - 5$ ---(ii) $P = (2,3)$

Differentiating (i) with respect to x, we get

$$2y\frac{dy}{dx} = 3ax^2$$

$$\therefore \quad \frac{dy}{dx} = \frac{3ax^2}{2y}$$

$$\therefore \quad m_1 = \left(\frac{dy}{dx}\right)_P = \frac{12a}{6} = 2a$$

m_2 = slope of (ii) = 4

According to the question

$m_1 = m_2 \Rightarrow 2a = 4 \Rightarrow a = 2$

From (i)

$$y^2 = 2 \times 2^3 + b$$

$$\Rightarrow \quad 9 = 16 + b$$

$$\Rightarrow \quad b = -7$$

Thus,

$a = 2, b = -7$

Tangents and Normals Ex 16.2 Q9

The given equatioins are,

$$y = x^2 + 4x - 16 \quad \text{---(i)}$$

$$3x - y + 1 = 0 \quad \text{---(ii)}$$

Slope m_1 of (i)

$$m_1 = \frac{dy}{dx} = 2x + 4$$

Slope m_2 of (ii)

$$m_2 = 3$$

As per question

$$m_1 = m_2$$

$$\Rightarrow \quad 2x + 4 = 3$$

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

From (i)

$$y = \frac{1}{4} - 2 - 16 = -\frac{71}{4}$$

$$\therefore \quad P = \left(\frac{-1}{2}, \frac{-71}{4}\right)$$

Thus, the equation of tangent

$$\left(y + \frac{71}{4}\right) = 3\left(x + \frac{1}{2}\right)$$

$$\Rightarrow \quad 3x - y = \frac{71}{4} - \frac{3}{2}$$

$$\Rightarrow \quad 3x - y = \frac{65}{4}$$

$$\Rightarrow \quad 12x - 4y - 65 = 0$$

Tangents and Normals Ex 16.2 Q10

The given equation is

$$y = x^3 + 2x + 6 \quad \text{---(i)}$$

$$x + 14y + 4 = 0 \quad \text{---(ii)}$$

Slope m_1 of (i)

$$m_1 = \frac{dy}{dx} = 3x^2 + 2$$

Slope m_2 of (ii)

$$m_2 = \frac{-1}{14}$$

$\therefore$ Slope of normal to (i) is

$$\frac{-1}{m_1} = \frac{-1}{3x^2 + 2}$$

According to the question

$$\frac{-1}{3x^2 + 2} = \frac{-1}{14}$$

$\Rightarrow \quad 3x^2 2 = 14$

$\Rightarrow \quad x^2 = 4$

$\Rightarrow \quad x = \pm 2$

From (i)

$y = 8 + 4 + 6$ or $-8 - 4 + 6$

$= 18$ or -6

so, $P = (2, 18)$ and $Q = (-2, -6)$

Thus, the equation of normal is

$$(y - 18) = \frac{-1}{14}(x - 2) \quad \Rightarrow \quad x + 14y + 86 = 0$$

or $\quad (y + 6) = \frac{-1}{14}(x + 2) \quad \Rightarrow \quad x + 14y - 254 = 0$

Tangents and Normals Ex 16.2 Q11

The given equations are,

$$y = 4x^3 - 3x + 5 \qquad \text{---(i)}$$

$$9y + x + 3 = 0 \qquad \text{---(ii)}$$

Slope m_1 of (i)

$$m_1 = \frac{dy}{dx} = 12x^2 - 3$$

Slope m_2 of (ii)

$$m_2 = \frac{-1}{9}$$

According to the question

$$m_1 \times m_2 = -1$$

$$\Rightarrow \quad \left(12x^2 - 3\right)\left(-\frac{1}{9}\right) = -1$$

$$\Rightarrow \quad 4x^2 - 1 = 3$$

$$\Rightarrow \quad x^2 = 1$$

$$\Rightarrow \quad x = \pm 1$$

From (i)

$$y = 4 - 3 + 5 \quad \text{or} \quad -4 + 3 + 5$$

$$= 6 \quad \text{or} \quad 4$$

$\therefore \; P = (1,6)$ or $Q = (-, 1, 4)$

Thus, the equation of tangent is

$$(y - 6) = 9(x - 1) \quad \Rightarrow \quad 9x - y - 3 = 0$$

$$(y - 4) = 9(x + 1) \quad \Rightarrow \quad 9x - y + 13 = 0$$

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