Tangents and Normals Ex 16.2 Q3(iii)

The equation of the curve is $y = x^2$.

On differentiating with respect to x, we get:

$$\frac{dy}{dx} = 2x$$

$$\left.\frac{dy}{dx}\right]_{(0,\,0)} = 0$$

Thus, the slope of the tangent at (0, 0) is 0 and the equation of the tangent is given as:

$$y - 0 = 0\,(x - 0)$$

$$\Rightarrow y = 0$$

The slope of the normal at (0, 0) is $\frac{-1}{\text{Slope of the tangent at (0, 0)}} = -\frac{1}{0}$, which is not defined.

Therefore, the equation of the normal at $(x_0, y_0) = (0, 0)$ is given by

$$x = x_0 = 0.$$

Tangents and Normals Ex 16.2 Q3(iv)

We know that the equation of tangent and the normal to any curve is given by

$$y - y_1 = m(x - x_1) \qquad \text{(A)} \quad \text{Tangent}$$

$$y - y_1 = \frac{-1}{m}(x - x_1) \qquad \text{(B)} \quad \text{Normal}$$

Where m is the slope

We have,

$$y = 2x^2 - 3x - 1 \qquad P = (1, -2)$$

Slope $m = \frac{dy}{dx} = 4x - 3$

$$m = \left(\frac{dy}{dx}\right)_P = 1$$

$\therefore$ equation of tangent from (A)

$$(y + 2) = 1(x - 1)$$

$\Rightarrow$ $x - y = 3$

And equation of normal from (B)

$$(y + 2) = -1(x - 1)$$

$\Rightarrow$ $x + y + 1 = 0$

Tangents and Normals Ex 16.2 Q3(v)

We know that the equation of tangent and the normal to any curve is given by

$$y - y_1 = m(x - x_1) \qquad \text{(A)} \quad \text{Tangent}$$

$$y - y_1 = \frac{-1}{m}(x - x_1) \qquad \text{(B)} \quad \text{Normal}$$

Where m is the slope

We have,

$$y^2 = \frac{x^3}{4 - x} \qquad P - (2, -2)$$

Differentiating with respect to x, we get

$$2y\frac{dy}{dx} = \frac{3x^2(4 - x) + x^3}{(4 - x)^2}$$

$$\Rightarrow \quad \frac{dy}{dx} = \frac{3x^2(4 - x) + x^3}{2y(4 - x)^2}$$

$$\therefore \text{ Slope } m = \left(\frac{dy}{dx}\right)_P = \frac{3 \times 4(4 - 2) + 8}{-2 \times 2(4 - 2)^2}$$

$$= \frac{32}{-16} = -2$$

From (A)

Equation of tangent is

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

$$\Rightarrow \quad 2x + y = 2$$

From (B)

Equation of Normal is

$$(y + 2) = \frac{1}{2}(x - 2)$$

$$\Rightarrow \quad x - 2y = 6$$

Tangents and Normals Ex 16.2 Q3(vi)

We know that the equation of tangent and the normal to any curve is given by

$$y - y_1 = m(x - x_1) \qquad \text{(A)} \quad \text{Tangent}$$

$$y - y_1 = \frac{-1}{m}(x - x_1) \qquad \text{(B)} \quad \text{Normal}$$

Where m is the slope

We have,

$$y = x^2 + 4x + 1 \qquad \text{and} \qquad P = (x = 3)$$

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

$$\therefore \quad m = \left(\frac{dy}{dx}\right)_p = 10$$

From (A)

Equation of tangent is

$$(y - 22) = 10(x - 3)$$

$$\Rightarrow \quad 10x - y = 8$$

From (B)

Equation of normal is

$$(y - 22) = \frac{-1}{10}(x - 3)$$

$$\Rightarrow \quad x + 10y = 223$$

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