Tangents and Normals Ex 16.1 Q19

The equation of the given curve is $\dfrac{x^2}{9} + \dfrac{y^2}{16} = 1$.

On differentiating both sides with respect to x, we have:

$$\frac{2x}{9} + \frac{2y}{16}\cdot\frac{dy}{dx} = 0$$

$$\Rightarrow \frac{dy}{dx} = \frac{-16x}{9y}$$

(i) The tangent is parallel to the x-axis if the slope of the tangent is i.e., $0 \dfrac{-16x}{9y} = 0$, which is

possible if $x = 0$.

Then, $\dfrac{x^2}{9} + \dfrac{y^2}{16} = 1$ for $x = 0$

$$\Rightarrow y^2 = 16 \Rightarrow y = \pm 4$$

Hence, the points at which the tangents are parallel to the x-axis are

$(0, 4)$ and $(0, -4)$.

(ii) The tangent is parallel to the y-axis if the slope of the normal is 0, which

gives $\dfrac{-1}{\left(\dfrac{-16x}{9y}\right)} = \dfrac{9y}{16x} = 0 \Rightarrow y = 0$.

Then, $\dfrac{x^2}{9} + \dfrac{y^2}{16} = 1$ for $y = 0$.

$$\Rightarrow x = \pm 3$$

Hence, the points at which the tangents are parallel to the y-axis are

$(3, 0)$ and $(-3, 0)$.

Tangents and Normals Ex 16.1 Q20

The equation of the given curve is $y = 7x^3 + 11$.

$$\therefore \frac{dy}{dx} = 21x^2$$

The slope of the tangent to a curve at (x_0, y_0) is $\dfrac{dy}{dx}\Big]_{(x_0, y_0)}$.

Therefore, the slope of the tangent at the point where $x = 2$ is given by,

$$\frac{dy}{dx}\Big]_{x=-2} = 21(2)^2 = 84$$

It is observed that the slopes of the tangents at the points where $x = 2$ and $x = -2$ are equal.

Hence, the two tangents are parallel.

Tangents and Normals Ex 16.1 Q21

The given equation of curve is

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

Slope of the tangent to (i) is

$$m_1 = \frac{dy}{dx} = 3x^2 \qquad \text{---(ii)}$$

Also,

given that slope of the tangent is parallel to x-coordinate of the point.

$$\therefore \qquad m_2 = \frac{dy}{dx} = x \qquad \text{---(iii)}$$

From (ii) and (iii)

$$m_1 = m_2$$
$$\Rightarrow \qquad 3x^2 = x$$
$$\Rightarrow \qquad 3x^2 - x = 0$$
$$\Rightarrow \qquad x(3x - 1) = 0$$
$$\Rightarrow \qquad x = 0 \qquad \text{or} \qquad \frac{1}{3}$$

$\therefore$ From (i)

$$y = 0 \qquad \text{or} \qquad \frac{1}{27}$$

Thus, the required point is $(0,0)$ or $\left(\frac{1}{3}, \frac{1}{27}\right)$.

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