Tangents and Normals Ex 16.1 Q19

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

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., $0\frac{-16x}{9y}=0$, which is possible if $x=0$.

Then, $\frac{x^2}{9}+\frac{y^2}{16}=1$ 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 $\frac{-1}{\left(\frac{-16x}{9y}\right)}=\frac{9y}{16x}=0 \Rightarrow y=0$.

Then, $\frac{x^2}{9}+\frac{y^2}{16}=1$ 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 $\left.\frac{dy}{dx}\right]_{(x_0, y_0)}$.

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

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

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.

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

From (ii) and (iii)

$$m_1 = m_2$$

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

$$\Rightarrow \quad 3x^2 - x = 0$$

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

$$\Rightarrow \quad x = 0 \quad \text{or} \quad \frac{1}{3}$$

$\therefore$ From (i)

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

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

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