Assignment 8

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Examine whether or not these pair of lines are perpendicular to each other

1. $y - 3x - 2 = 0$ and $3y + x + 9 = 3$

Let $A = y - 3x - 2 = 0$

$= \frac{dy}{dx} - 3 - 0 = 0$

$= \frac{dy}{dx} - 3 = 0$

$\frac{dy}{dx} = 3$

Let $B = 3y + x + 9 = 0$

$3\frac{dy}{dx} + 1 + 0 = 0$

$3\ dy/dx + 1 = 0$

$3\frac{dy}{dx} = -1$

$\therefore \frac{dy}{dx} = \frac{-1}{3}$

Therefore $y - 3x - 2 = 0$ is perpendicular to $3y + x + 9 = 0$

2 $3y - 4 = 2x + 3$ and $y - 5 = x + 6$

Let $A \Rightarrow 3y - 4 = 2x + 3$

$3\,dy/dx - 0 = 2 + 0$

$3\frac{dy}{dx} = 2$

$\therefore \frac{dy}{dx} = \frac{2}{3}$

Let $B \Rightarrow y - 5 = x + 6$

$dy/dx - 0 = 1 + 0$

$\frac{dy}{dx} = 1$

$\therefore A \neq B$

Therefore $3y - 4 = 2x + 3$ and $y - 5 = x + 6$ is not perpend

3 Find the equations of the tangent and norma to the curve $x^2 + y^2 + 3xy - 11 = 0$ at the point $x = 1, y = 2$

$x^2 + y^2 + 3xy - 11 = 0$

$2x + 2y\frac{dy}{dx} + 3(x \times dy/dx + y \cdot 1) - 0 = 0$

$2x + 2y\,dy/dx + 3x\,dy/dx + 3y = 0$

$2y\,dy/dx + 3x\,dy/dx = -2x - 3y$

$\frac{dy}{dx} = \frac{-2x - 3y}{2y + 3x}$

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

When $x_1 = 1$ and $y_1 = 2$

$m = -\frac{[2(1) + 3(2)]}{2(2) + 3(1)}$

$m = -\frac{(2 + 6)}{4 + 3} = -\frac{8}{7}$

$\therefore m = -\frac{8}{7}$

Equation of the tangent to a curve

$$y - y_1 = m(x - x_1)$$

$$y - 2 = -\frac{8}{7}(x - 1)$$

$$y - 2 = \frac{-8x}{7} + \frac{8}{7}$$

$$y - 2 = \frac{-8x + 8}{7}$$ (cross multiply)

$$7(y - 2) = -8x + 8$$

$$7y - 14 = -8x + 8$$

$$7y - 14 + 8x - 8 = 0$$

$$7y + 8x - 22 = 0$$

Equation of the normal to a curve

$$m_1 m_2 = -1$$

$$-\frac{8}{7} \cdot m_2 = -1$$

$$m_2 = \frac{-1}{-\frac{8}{7}}$$

$$m_2 = 7/8$$

$$y - y_1 = m(x - x_1)$$

$$y - 2 = \frac{7}{8}(x - 1)$$

$$y - 2 = \frac{7x - 7}{8}$$ (cross multiply)

$$8(y - 2) = 7x - 7$$

$$8y - 16 = 7x - 7$$

$$8y - 16 - 7x + 7 = 0$$

$$8y - 7x - 9 = 0$$