

19/MAY/2011

Q Medicine and Surgery.

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

$$1. \quad y - 3x - 2 = 0 \quad \text{and}$$

$$2) \quad 3y + x + 9 = 0$$

For Perpendicular lines, $m_1 m_2 = -1$

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

$$y = 3x + 2$$

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

$$\therefore m_1 = 3$$

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

$$3y = -x - 9$$

$$y = -\frac{x}{3} - 3$$

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

$$\therefore m_2 = -\frac{1}{3}$$

$$\bullet \quad m_1 m_2 = 3 \times -\frac{1}{3}$$

$$= -1$$

$\therefore y - 3x - 2 = 0$ and $3y - x + 9 = 0$ are PERPENDICULAR

$$2) \quad 3y - 4 = 2x + 3 \quad \text{and} \quad y - 5 = x + 6$$

For Perpendicular lines, $m_1 m_2 = -1$

$$3y - 4 = 2x + 3$$

$$3y = 2x + 7$$

$$y = \frac{2}{3}x + \frac{7}{3}$$

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

$$\therefore m_1 = \frac{2}{3}$$

$$y - 5 = x + 6$$

$$y = x + 11$$

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

$$\therefore m_2 = 1$$

$$m_1 m_2 = \frac{2}{3} \times 1 = \frac{2}{3}$$

\therefore The lines $3y - 4 = 2x + 3$ and $y - 5 = x + 6$ are **NOT** PERPENDICULAR

$$x^2 + y^2 + 3xy - 11 = 0 \text{ at point } x = 1, y = 2$$

$$\frac{dy}{dx} = 2x + 2y \frac{dy}{dx} + 3y + 3x \frac{dy}{dx} = 0$$

$$2x + 2y \frac{dy}{dx} + 3(y + x \frac{dy}{dx}) = 0$$

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

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

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

$$\left. \frac{dy}{dx} \right|_{(1,2)} = \frac{-2(1) - 3(2)}{2(2) + 3(1)}$$

$$= \frac{-2 - 6}{4 + 3}$$

$$\frac{dy}{dx} = -\frac{8}{7}$$

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

Equation of tangent

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

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

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

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

Equation of normal:

$$y - y_1 = -\frac{1}{m}(x - x_1)$$

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

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

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

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