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

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

$$\frac{dy}{dx} = \frac{-2-6}{4+3} = \frac{-8}{7}$$

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

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

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

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

$$7y+8x-22=0 \quad \text{(Equation of the tangent)}$$

$$m_1 m_2 = -1$$

$$m_2 = \frac{-1}{m_1}$$

$$= \frac{7}{8}$$

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

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

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

$$8y-7x-9=0 \quad \text{(Equation of the normal)}$$

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MAI 104

ASSIGNMENT

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

$3y + x + 9 = 0$

Finding m_1: $y - 3x - 2 = 0$

$y = 3x + 2$

Compare: $y = mx + c$

$m_1 = 3$

Finding m_2: $3y + x + 9 = 0$

$3y = -x - 9$

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

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

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

$= -1$

Since $m_1 m_2 = -1$, then the lines are therefore perpendicular to each other.

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

$y - 5 = x + 6$

Finding m_1: $3y = 2x + 3 + 4$

$3y = 2x + 7$

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

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

Find m_2: $y = x + 6 + 5$

$y = x + 11$

$\therefore m_2 = 1$

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

$= \frac{2}{3}$

Since $m_1 \neq m_2$ and $m_1 m_2 \neq -1$ then therefore the lines are neither parallel nor perpendicular to each other.

3. $x^2 + y^2 + 3xy - 11 = 0 \quad (1, 2)$

$\frac{dy}{dx} \Rightarrow 2x + 2y\frac{dy}{dx} + 3\left(x\frac{dy}{dx} + y \cdot 1\right) = 0$

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

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

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