

MATHS 102

NAME: HARRISON DAVIDA EBRECHI

DEPT: MEDICINE AND SURGERY

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

To get m_1

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

making y the subject of the formula

$$y = 3x + 2$$

$$y = mx + c$$

where $m_1 = 3$

To get m_2

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

$$3y = -x - 9$$

$$y = -\frac{1}{3}x - 3$$

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

$$\therefore m_1 m_2 = -1$$

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

$$-1 = -1$$

$$\therefore y - 3x - 2 = 0 \text{ \& } 3y + x + 9 = 0$$

is perpendicular

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

To get m_1 ,

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

$$3y = 2x + 7$$

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

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

To get m_2

$$y - 5 = x + 6$$

$$y = x + 11$$

$$y = mx + c$$

$$m_2 = 1$$

$$\therefore m_1 m_2 = -1$$

$$\frac{2}{3} \times 1 = -1$$

$$\frac{2}{3} \neq -1$$

So, $3y - 4 = 2x + 3$ and $y - 5 = x + 6$ are not perpendicular.

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

$$2x + 2y \frac{dy}{dx} + 3[x \cdot \frac{dy}{dx} + y \cdot 1] = 0$$

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

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

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

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

Equation of tangent

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

where $[x = 1, y = 2]$

$$\frac{dy}{dx} = \frac{-2[1] - 3[2]}{2[2] + 3[1]}$$

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

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

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

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

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

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

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

Equation of normal

$$m_1 m_2 = -1$$

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

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

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

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

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

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