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19/MHSDI/062  
Medicine and Surgery  
MHS

ASSIGNMENT

7/4/20

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

For perpendicular lines,  $m_1 m_2 = -1$

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

$$y = 3x + 2$$

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

$$\therefore m_1 = 3$$

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

$$3y = -x - 9$$

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

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

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

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

Therefore,  $y - 3x - 2 = 0$  and  $3y - x + 9 = 0$  are PERPENDICULAR

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

For perpendicular lines,  $m_1 m_2 = -1$

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

$$3y = 2x + 7$$

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

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

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

$$y - 5 = 2x + 6$$

$$y = 2x + 11$$

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

$$\therefore m_2 = 1$$

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

Therefore, the lines  $3y - 4 = 2x + 3$  and  $y - 5 = 2x + 6$  are NOT PERPENDICULAR.

(3)

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

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

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

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

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

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

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

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

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

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

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

$$y - y_1 = \frac{-1}{3} (x - x_1)$$

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

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

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

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