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Matric No: 19/MHS01/086

No 2

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$3y - 4 = 2x + 3$ — (1)
$y - 5 = x + 6$ — (2)

$3y = 2x + 3 + 4$
$3y = 2x + 7$
$y = \frac{2x}{3} + \frac{7}{3}$

$y = mx + c$
$m_1 = \frac{2}{3}$

$y - 5 = x + 6$
$y = x + 6 + 5$
$y = x + 11$

By Comparing with $y = mx + c$
$m_2 = 1$

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

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

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

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

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

$\frac{dy}{dx}$

$y = mx + c$

$m_1 = 3$

$3y + x + 9 = 0$

$3y = -x - 9$

$y = \frac{-x}{3} - \frac{9}{3}$

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

$y = mx + c \cdot \; m_2 = -1/3$

$m_1 m_2 = -1$

Since $m_1 m_2 = -1$ the lines $y - 3x - 2 = 0$ and $3y + x + 9 = 0$ are perpendicular.

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

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

$7y + 8x - 22 = 0$ is the equation of the tangent

b) for Equation of normal

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

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

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

$8(y - 2) = 7(x - 1)$

$8y - 16 = 7x - 7$

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

$8y - 7x - 9 = 0$

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

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

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

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

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

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

$$m = \left.\frac{dy}{dx}\right|_{x=1,\ y=2} = \frac{-2(1) - 3(2)}{2(2) + 3(1)} = \frac{-2 - 6}{4 + 3} = \frac{-8}{7}$$

Equation of tangent:

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

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

$$7(y - 2) = -8(x - 1)$$

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

$$3y + x + q = 0$$

$$m_1 m_2 = -1$$

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

$$y = +3x + 2$$

$$y = 3x + 2$$