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19/MHsol/275

MBBS

MAT 104 Assignment.

$$y - 3x - 2 = 0 \quad \text{and} \quad 3y + x + 9 = 0$$

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

$$y = 3x + 2$$

recall $y = mx + c$

$$\therefore m_1 = 3$$

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

$$3y = -x - 9$$

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

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

recall also that for perpendicular lines $m_1 m_2 = -1$.

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

\therefore the equations $y - 3x - 2 = 0$ and $3y + x + 9 = 0$ are perpendicular.

$$\frac{y - c_1}{a_1} = \frac{(c_2 + (y - c_1)) - c_2}{(a_2 + (y - c_1)) - c_2} = m$$

$$y - c_1 = m$$

$$y = m + c_1$$

substituting for y in eqn 1

$$(a_1 - m) x = (a_2 - m) y$$

$$(a_1 - m) x = (a_2 - m) y$$

$$x = \frac{(a_2 - m) y}{(a_1 - m)}$$

$$(a_1 - m) \frac{(a_2 - m) y}{(a_1 - m)} = (a_2 - m) y$$

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

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

$$3y - 2x - 4 - 3 = 0$$

$$3y - 2x - 7 = 0$$

$$3y = 2x + 7$$

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

recall $y = mx + c$.

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

For $y - 5 = x + 6$

$$y = x + 6 + 5$$

$$y = x + 11$$

$$\therefore m_2 = 1$$

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

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

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

$$\frac{dy}{dx} = m \quad m = \frac{dy}{dx} \Big|_{x=1}$$

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

b) Equa

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

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

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

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

$$\frac{dy}{dx} = \frac{-2x - 3y}{2y + 3x} \quad \frac{1}{2} x = \frac{(2x + 3y)}{2y + 3x}$$

$$m = \frac{dy}{dx} \Big|_{x=1; y=2}$$

$$m = \frac{-(2(1) + 3(2))}{2(2) + 3(1)} = \frac{-8}{7}$$

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

a) Equation of tangent.

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

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

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

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

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

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

b) Equation of the normal.

$$m = \frac{-1}{m} = \frac{-1}{-\frac{8}{7}} = \frac{7}{8}$$

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

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

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

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

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

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