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19/MHS/178 /MBBS
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7th April, 2020

MAT ASSIGNMENT

Solutions

1) $\cancel{y}$ $y - 3x - 2 = 0$
$3y + x + 9 = 0$

$y - 3x - 2 = 0$

Make y subject of formula

$y = 3x + 2$

$\therefore y = mx + c$

$\therefore m_1 = \underline{3}$

$3y + x + 9 = 0$

Make y subject of formula

$3y = -x - 9$

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

Recall that $y = mx + c$

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

$\therefore m_1 m_2 = -1$

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

Since $m_1 m_2 = -1$, these pair of lines are perpendicular to each other.

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

$3y - 5 = x + 6$

$3y - 4 = 2x + 3$

Make y a subject of formula

$3y = 2x + 7$

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

Recall that $y = mx + c$

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

$y - 5 = x + 6$

Make y subject of formula

$y = x + 11$

$\therefore M_2 = 1$

$\therefore M_1 M_2 = -1$

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

In this equation $M_1 M_2 \neq -1$, so these pair of line are not perpendicular to each other

8) $x^2 + y^2 + 3xy - 11 = 0$ at point $(x = 1, y = 2)$

Soln

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

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

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

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

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

$\therefore$ at $(x = 1, y = 2)$

$$\frac{dy}{dx}(m) = \frac{-2(1) - 3(2)}{2(2) + 3(1)}$$

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

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

$$\therefore \frac{dy}{dx}(m) = \frac{-8}{7}$$

Equation of a tangent $= (y - y_1) = m(x - x_1)$

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

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

$\therefore$ Equation of a tangent $= 7y + 8x - 22 = 0$

Equation of the normal $= (y - y_1) = \frac{-1}{m}(x - x_1)$

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

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

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

Eqn of the normal $= 8y - 7x - 9 = 0$

$\therefore$ The eqn of the normal $= 8y - 7x - 9 = 0$