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19/mhs01/113
MAT104 Assignment
MEDICINE & SURGERY

1) $y - 3x - 2 = 0$ — ①

$3y + x + 9 = 0$ — ②

for these lines to be perpendicular

$m_1 m_2 = -1$

For ①: $y = 3x + 2$

Comparing with $y = mx + b$

$m_2 = -1/3$

Using $m_1 m_2 = -1$ to prove if they are perpendicular $\therefore 3x - 1/3 = -1$

$\therefore$ The lines are perpendicular to each other since $m_1 m_2 = -1$

2) $3y - 4 = 2x + 3$ — ①

$y - 5 = x + b$ — ②

making y subject of formular in ① & ②

$y = \frac{2}{3}x + 7$ — ③

$y = x + 11$ — ④

For ③ $y = \frac{2}{3}x + 7$

Comparing with $y = mx + c$

$m_1 = 2/3$

for ④ : $y = x + 11$

Comparing with $y = mx + c$

$m_2 = 1$

$2/3 \times 1 = 2/3$

Since $m_1 m_2 \neq -1$ (∴ the lines are not perpendicular

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

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

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

making dy/dx subject of formula

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

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

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

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

$$y - y_2 = -8/4\,(x - 1)$$

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

$7y + 8x - 22 = 0$ (which gives expression of tangent)

$$y - y_1 = \frac{1}{m_1}(x - x_1)$$

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

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

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

(which gives equation of the normal)