Name: Ashaka Michael Emeghara
Department: Medicine and Surgery
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Assignment

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

Solution

If Perpendicular lines, $m_1 m_2 = -1$

$y = 3x + 2$ — ①

$y = -\frac{x}{3} + 3$ — ②

$m_1 = 3$

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

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

∴ These lines are perpendicular to each other

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

Solution

Perpendicular lines, $m_1 m_2 = -1$

$y = \frac{2}{3}x + \frac{7}{3}$ — ①

$y = x + 11$ — ②

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

$m_2 = 1$

$\frac{2}{3} \times 1 = \frac{2}{3}$ ∴ These lines are not perpendicular to each other

Equation of normal

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

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

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

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

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

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

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

Equation of the normal

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

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

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

$\frac{dy}{dx}$

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

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

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

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

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

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

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

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

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

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

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

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

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