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ASSIGNMENT 8

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

SOLUTION

$y - 3x - 2 = 0$ - eqn 1

$y = 3x + 2$

$y = mx + c$

$m_1 = 3$.

$\frac{3y}{3} + \frac{x}{3} + \frac{9}{3} = 0$ - eqn 2

$y + \frac{x}{3} + 3 = 0$

$y = -\frac{x}{3} - 3 = 0$

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

Perpendicular line: $m_2 = \frac{-1}{m_1}$

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

$\therefore$ $y - 3x - 2 = 0$ and $3y + x + 9 = 0$ are perpendicular to each other.

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

SOLUTION

$-2x + 3y - 1 = 0$ — eqn 1.

$\frac{3y}{3} = \frac{2x}{3} + \frac{1}{3}$

$y = \frac{2x}{3} + \frac{1}{3}$

$y = mx + c$

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

$y - 5 = x + 6$

$-x + y - 11 = 0$ — eqn 2.

$y = x + 11$

$m_2 = 1$.

Perpendicular: $m_1 = \frac{-1}{m_2}$

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

∴ $3y - 4 = 2x + 3$ and $y - 5 = x + 6$ are not perpendicular to eachother

Or, $-2x + 3y - 1$ and $-x + y - 11$ are not perpendicular to eachother

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

SOLUTION

$2x + 2y\frac{dy}{dx} + 3(xy) - 11 = 0$

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

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

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

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

$3x + 2y \qquad 3x + 2y$

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

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

$\frac{-(2(1) + 3(2))}{3(1) + 2(2)} = \frac{-(2+6)}{3+4} = \frac{-8}{7}$

$m_1 = -\frac{8}{7}$.

Tangent: $y - y_1 = m_1(x - x_1)$

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

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

$8x + 7y - 22 = 0$: which gives you the equation of the tangent.

Normal: $m_2 = \frac{-1}{m_1} = -1 \div -\frac{8}{7}$

$m_2 = \frac{7}{8}$

$(y - y_1) = m_2(x - x_1)$

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

$8y - 16 = 7x - 7$

$-7x + 8y + 9 = 0$: which gives you the equation of the normal.