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QUESTIONS

4. Examine whether or not these pair of lines are perpendicular to each other.

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

Solution

$y - 3x - 2 = 0$

$3y + x + 9 = 0$

Fix the lines to be perpendicular then $m_1 m_2 = -1$

$y - 3x - 2 = 0$

Making y the subject of the formula

$y = +3x + 2$

$y = 3x + 2$

By comparison with $y = mx + c$

$m_1 = 3$

$3y + x + 9 = 0$

Making y the subject of the formula

$3y = -x - 9$

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

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

$y = mx + c \cdot m_2 = -1/3$

$m_1 m_2 = -1$ Hence perpendicularly

$3x - 1/3 = -9$. Since $m_1 m_2 = -1$ Therefore the lines $y - 3x - 2 = 0$ and $3y + x + 9 = 0$ ARE PERPENDICULAR

2. $3y - 4 = 2x + 3$ ..... (1)

$y - 5 = x + 6$ ..... (2)

Making y the subject of formular in 1

$3y = 2x + 3 + 4$

$3y = 2x + 7$

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

By comparing with $y = mx + c$.

$m_1 = 2/3$

Making y the subject of formular in 2.

$y - 5 = x + 6$

$y = x + 6 + 5$

$y = x + 11$

By comparing with $y = mx + c$

$m_2 = 1$

But for the lines to be perpendicular;

$m_1 m_2 = -1$

$m_1 m_2 = 2/3 \times 1 = 2/3$

$m_1 m_2 \neq -1$

Here the lines $3y - 4 = 2x + 3$ and $y - 5 = x + 6$

ARE NOT PERPENDICULAR.

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

$m = dy/dx$

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

$\frac{dy}{dx}$

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

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

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

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

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

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

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

A Equation of tangent

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

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

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

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

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

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

B Equation of Normal

$$y - y_1 = -1/m(x - x_1)$$

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

$y-2 = 7/8\,(x-1)$

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

$8y - 16 = 7x - 7$

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

$8y - 7x - 9 = 0$. Is the equation of normal