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Answer:-

1.) $y - 3x - 2 = 0$

$3y + x + 9 = 0$

solution

$y = mx + c$

$y - 3x - 2 = 0$

make y subject of formula

$y = 3x + 1$

$\therefore m_1 = 3$

$3y + x + 9 = 0$

$3y = -x - 9$

Divide by 3

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

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

$y = mx + c$

$\therefore m_2 = -1/3$

for the lines to be perpendicular;

$m_1 m_2 = -1$

$3x - 1/3 = -1$

Since $m_1 m_2 = -1$, then lines $y - 3x - 2 = 0$ and $3y + x + 9 =$ are perpendicular.

b) equation of a normal

$m_1 m_2 = -1$

$\frac{-9}{7} m_2 = -1$

$m_2 = -1 \div -9/7$

For the lines to be perpendicular

$m_1 m_2 = -1$

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

~~For the lines to be perpendicular~~

$m_2 \neq -1$

∴ lines $8y - 4 = 2x + 3$ and $y - 9 = x + 6$ are not perpendicular.

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

Solution

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

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

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

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

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

$$\frac{dy}{dx}\ x=1;\ y=2 \quad = \frac{-2(1) - 3(2)}{2(2) + 3(1)} = \frac{-2 - 6}{4 + 3} = \underline{-8/7}$$

$$\therefore m_1 = \underline{-8/7}$$

b) Equation of tangent

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

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

$$y - 2 = \frac{-8x + 8}{7}$$

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

$m_2 = -1 \times -7/8$

$m_2 = 7/8$

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

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

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

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

$8y - 16 = 7x - 7$

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

$8y - 7x - 9 = 0$

27) $3y - 4 = 2x + 3$

$y - 5 = x + 6$

solution

make y the subject of the formula

$3y = 2x + 3 + 4$

$3y = 2x + 7$

Divide through by 3

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

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

$y = mx + c$ (by comparing)

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

$y - 5 = x + 6$

make y the subject of the formular

$y = x + 6 + 5$

$y = x + 11$

R. comparing with $y = mx + c$

$$7y - 14 = -8x + 8$$
$$7y + 8x - 14 - 8 = 0$$
$$7y + 8x - 22 = 0$$