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MATRIC NO: 19/MHS01/076
MBBS

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

Let $A: y - 3x - 2 = 0$

$\frac{dy}{dx} - 3 - 0 = 0$

$\frac{dy}{dx} - 3 = 0$

$\frac{dy}{dx} = 3$

$m_1 = 3$

Let $B: 3y + x + 9 = 0$

$3\frac{dy}{dx} + 1 = 0$

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

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

m_2

$A \perp B$

i.e $y - 2x - 2 = 0$ is perpendicular to $3y + x + 9 = 0$

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

Let $A = 3y - 4 = 2x + 3$

$3\frac{dy}{dx} = 2$

$\frac{dy}{dx} = \frac{2}{3}$

Let $B = y - 5 = x + 6$

$\frac{dy}{dx} = 1$

$\therefore A \neq B$

i.e $3y - 4 = 2x + 3$ and $y - 5 = x + 6$ is not perpendicular

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

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

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

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

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

where $x = 1$ and $y = 2$

$\frac{dy}{dx} = \frac{-2 - 6}{4 + 3}$

$\frac{dy}{dx} = -\frac{8}{7}$ $\quad m_1 = -\frac{8}{7}$

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

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

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

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

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

$7y + 8x - 22 = 0$

Equation of the tangent

$m_1 m_2 = -1$

$m_2 = \frac{-1}{-\frac{8}{7}} = \frac{7}{8}$

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

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

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

$8y - 16 = 7x - 7$

$8y - 7x - 9 = 0$