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DEPT: MBBS

Assignment

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

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

Answers

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

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

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

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

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

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

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

$\therefore y - 3x - 2 = 0$ is perpendicular to $3y + x + 9 = 0$

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

Answers

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

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

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

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

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

$A \neq B$

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

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

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

$7y+8x = 8+14$

$7y+8x = 22$

$7y+8x-22=0$

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

b) From the equation of normal to the curve

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

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

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

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

$8y-16 = 7x-7$

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

$8y-7x = 9$

$7x-8y+9=0$

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

2 Find the equations of the tangent and normal to the curve $x^2 + y^2 + 3xy - 11 = 0$ at the point $x = 1, y = 2$

Answers

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

Differentiated w.r.t x

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

$$2x + 2y\, dy/dx + 3x\, dy/dx + 3y = 0$$

$$2y\, dy/dx + 3x\, dy/dx = -2x - 3y$$

$$dy/dx\,(2y + 3x) = -2x - 3y$$

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

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

where $x = 1, y = 2$

$$m = -\frac{[2(1) + 3(2)]}{2(2) + 3(1)}$$

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

$\therefore m = -8/7$

a From the equation of the tangent to a curve

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