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

Soultion

$y - 3x - 2 = 0$

$3y + x + 9 = 0$

For the Lines to be Perpendicular then $m_1 \times m_2 = -1$

$y - 3x - 2 = 0$

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 subject of the formula

$3y = -x - 9$

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

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

$y = mx + c$, $m_2 = -1/3$

$m_1 m_2 = -1$ for perpendicular

~~3x~~ $B \times -1/3 = -1$, since $m_1 m_2 = -1$

Take the line $y - 3x - 2 = 0$

and $3y + x + 9 = 0$ are perpendicular.

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

$y - 5 = x + 6$

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

$3\ dy/dx - 0 = 2 + 0$

$3\ dy/dx = 2$

$dy/dx = 2/3$

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

$dy/dx - 0 = 1 + 0$

$dy/dx = 1$

$\therefore A \neq B$

ie $3y - 4 = 2x + 3$

and $y - 5 = x + 6$ is non perpendicular.

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

$2x + 2y\, dy/dx + 3(x \times dy/dx + y \times 1) - 0 = 0$

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

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

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

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

m = when $x = 1$ and $y = 2$

$m = x = 1$ and $y = 2$

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

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

$m = \frac{-8}{7}$

Equation of the tangent to a curve

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

~~$y - 2 = 8/7$~~

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

$$y-2 = -8x/7 + 8/7$$

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

b) Equation of the normal to a curve

$$y - y_1 = \frac{-1}{m}(x - x_1)$$
$$y - 2 = +1/-8/7\ (x - 1)$$

$$y - 2 = 7/8\ (x - 1)$$
$$y - 2 = 7x/8 - 7/8$$
$$8y - 16 = 7x - 7$$
$$8y = 7x - 7 + 16$$
$$7x - 8y + 9 = 0$$