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

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

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

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

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

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

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

$3\,dy/dx + 1 = 0$

$dy/dx = -1/3$

$A + B$

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

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

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

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

$3\,dy/dx = 2$

$dy/dx = 2/3$

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

$dy/dx - 0 = 1 + 0$

$dy/dx = 1$

$\therefore A \neq B$

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

$8y = 7x - 7 + 16$

$7x - 8y + 9 = 0$

③ $x^2+y^2+3y-11=0$ at point $(1,2)$

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

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

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

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

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

When $x=1$ and $y=2$

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

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

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

Equation of the tangent to a curve

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

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

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

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

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

$8x+7y-22=0$

b Equation of the normal to a curve

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

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

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

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

$8y-16 = 7x-7$