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

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

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

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

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

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

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

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

$\therefore B \perp k$ ie $y - 3x - 2 = 0$ is perpendicular to $3x + x + 9 = 0$

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

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

$3y - 0 = 2 + 0$

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

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

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

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

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

$\therefore C \not\perp D$

ie $3y - 4 = 2x + 3$ is not perpendicular to $y - 5 = x + 6$

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

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

$\frac{dy}{dx} = 2x + 2y\frac{dy}{dx} + 3[x\,dy/dx + y] - 0 = 0$

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

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

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

$\left.\frac{dy}{dx}\right|_{x=1, y=2} \frac{-2(1) - 3(2)}{2(1) - 3(2)} = \frac{-2-6}{4+3}$

$M = \frac{-8}{7}$ or $-1\frac{1}{7}$

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

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

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

$7y - 14 = -8 + 8$

$7y + 8x - 22 = 0$ [Equation of Tangent]

~~$M = -1$~~

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

$y - 2 = +1/+8/7\,(x - x_1)$

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

$8y - 16 = 7x - 7$

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

$8y - 7x = 9 \therefore 8y - 7x - 9 = 0$ [Equation of Normal]