

⑤ $x^2 + y^2 + 3y - 11 = 0$ at Point $(1, 2)$

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

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

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

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

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

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

$$m = \frac{-(2(1) + 3(2))}{2(2) + 3(1)} = \frac{-(2+6)}{4+3} = \frac{-8}{7}$$

$$m = -8/7$$

⑥ Equation of the tangent to the curve

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

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

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

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

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

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

⑦ Equation of the normal to a curve

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

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

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

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

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

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

$$7x - 8y + 9 = 0$$

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Assignment:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

A \neq B

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

$$\textcircled{5} x^2 + y^2 + 3y - 11 = 0$$
$$2x + 2y \left(\frac{dy}{dx} \right) + 3x$$
$$2x + 2y \left(\frac{dy}{dx} \right) + 3x$$

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

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

when $x = 1$ and $y =$

$$M = -\frac{2(1) + 3}{2(1) + 3}$$

$$M = -8/7$$

Equation of the

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

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

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

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

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

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

Equation of

$$y - y_1 =$$

$$y - 2 =$$

$$y - 2 = 7$$

$$y - 2 = 7$$

$$8y - 16 =$$

$$8y = 16$$

$$y = 2$$

$$1x - 2 =$$