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COMPUTER SCIENCE

19/sci01/063

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1) Given $x^2 + y^2 - 5x - y + 4 = 0$ - equation of line $y - y_1 = m(x - x_1)$

at $[1, 0]$ Using implicit differentiation $y - 0 = -\frac{5}{6}(x - 1)$

$$2x + 2y \frac{dy}{dx} - 5 - \frac{dy}{dx} + 0 = 0$$

$$2y \frac{dy}{dx} - \frac{dy}{dx} = 5 - 2x$$

$$\frac{dy}{dx} [2y - 1] = 5 - 2x$$

$$\therefore \frac{dy}{dx} = \frac{5 - 2x}{2y - 1} \text{ at } [1, 0]$$

$$\frac{dy}{dx} = \frac{5 - 2(1)}{2(0) - 1}$$

$$\frac{dy}{dx} = \frac{5 - 2}{0 - 1}$$

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

$$\frac{dy}{dx} = -3; \text{ Gradient } [m] = -3 \text{ at } [1, 0]$$

Equation of the line is Using eqn of a straight line

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

$$y - 0 = -3(x - 1)$$

$$y - 0 = -3x + 3$$

$$y = -3x + 3$$

$$m = -3 \quad c = +3$$

$$y = -3x + 3$$

$$m = -3 \quad c = +3$$

2) Using implicit differentiation

$$2x + 2y \frac{dy}{dx} - 12 - 12 \frac{dy}{dx} + 0 = 0$$

$$2y \frac{dy}{dx} - 12 \frac{dy}{dx} = 12 - 2x$$

$$\frac{dy}{dx} = \frac{12 - 2x}{2y - 12} \text{ at } [1, 0]$$

$$\frac{dy}{dx} = \frac{12 - 2(1)}{2(0) - 12} = \frac{12 - 2}{-12} = \frac{10}{-12} = -\frac{5}{6}$$

$$\therefore m = -\frac{5}{6} \text{ at } [1, 0]$$

$$3) x^2 + y^2 - 8x + 4y + 40 = 0$$

Using implicit differentiation

$$2x + 2y \frac{dy}{dx} - 8 + 4 \frac{dy}{dx} + 0 = 0$$

$$\frac{dy}{dx} [2y + 4] = 8 - 2x$$

$$\frac{dy}{dx} = \frac{8 - 2x}{2y + 4} \text{ at } [1, 0]$$

$$\frac{dy}{dx} = \frac{8 - 2(1)}{2(0) + 4}$$

$$\frac{dy}{dx} = \frac{8 - 2(1)}{2(0) + 4} = \frac{8 - 2}{4} = \frac{6}{4}$$

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

$$m = \frac{3}{2} \text{ at } [1, 0] \text{ Using}$$

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

$$y - 0 = \frac{3}{2}(x - 1); y = \frac{3x - 3}{2}$$

$$y = \frac{3x}{2} - \frac{3}{2}$$