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Mechanical Engineering
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Assignment

1) Point (1, 0)

Equation of the circle: $x^2 + y^2 - 5x - y + 4 = 0$

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

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

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

when $x = 1, y = 0$

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

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

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

$$= -3$$

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

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

$$y = -3x + 3 \quad (\text{equation of the tangent})$$

2) Point (1, 0)

Equation of the circle: $x^2 + y^2 - 12x - 12y + 47 = 0$

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

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

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

$$\frac{dy}{dx} = \frac{6 - x}{y - 6}$$

$$\text{when } x=1, y=0$$

$$m = \frac{6-1}{0-6}$$

$$= \frac{5}{-6}$$

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

$$y - 0 = -\frac{5}{6}(x - 1)$$

$$y = -\frac{5}{6}x + \frac{5}{6}$$

$$6y = -5x + 5 \text{ (equation of the tangent)}$$

3) Point (1, 0)

$$\text{Equation of the circle: } x^2 + y^2 - 8x + 14y + 10 = 0$$

$$2x + 2y \frac{dy}{dx} - 8 + 14 \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} (2y + 14) = 8 - 2x$$

$$\frac{dy}{dx} = \frac{8 - 2x}{2y + 14}$$

$$\text{when } x=1, y=0$$

$$m = \frac{8 - 2(1)}{2(0) + 14}$$

$$= \frac{8 - 2}{0 + 14}$$

$$= \frac{6}{14}$$

$$= \frac{3}{7}$$

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

$$y - 0 = \frac{3}{7}(x - 1)$$

$$7y = 3x - 3 \text{ (equation of the tangent)}$$