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MATRIC.

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DEPT. PETROLEUM ENGINEERING.

2. Find the equation of the tangent at the point $(1,0)$ on the circle: $x^2 + y^2 - 12x - 12y + 47 = 0$

Solution.

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

$$x^2 + y^2 - 12x - 12y = -47$$

$$x^2 - 12x + 6^2 + y^2 - 12y + 6^2 = -47 + 36 + 36$$

$$(x+6)^2 + (y+6)^2 = 25$$

$$\text{Centre} = (-6, -6)$$

$$\text{Radius} = 5$$

$$\text{Gradient of the radius} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{0 + 6}{-6 - 1} = \frac{6}{-7}$$

$$\text{Gradient of tangent} = \frac{6}{7} \times M = -1$$

$$\frac{6M}{7} = -1$$

$$6M = -7$$

$$M = -\frac{7}{6}$$

Equation of tangent to the circle: $y - y_1 = m(x - x_1)$

$$y - y_1 = \frac{-7}{6}(x - x_1)$$

$$\text{Sub } P(1,0) \Rightarrow y - 0 = \frac{-7}{6}(x - 1)$$

$$y = \frac{-7x}{6} + \frac{7}{6} + 0$$

$$\therefore y = \frac{-7x}{6} + \frac{7}{6}$$

3. Find the equation of the tangent at the point $(1, 0)$ on the circle: $x^2 + y^2 - 8x + 14y + 40 = 0$

Solution.

Equation of the circle: $x^2 + y^2 - 8x + 14y + 40 = 0$

$$x^2 + y^2 - 8x + 14y = -40$$

$$x^2 - 8x + 4^2 + y^2 + 14y + 49^2 = -40$$

$$(x+4)^2 + (y+7)^2 = -40 + 16 + 49$$

$$x^2 - 8x + 16 + y^2 + 14y + 49 = -40 + 16 + 49$$

$$(x+4)^2 + (y-7)^2 = 25$$

$$\text{Centre} = (-4, 7)$$

$$\text{Radius} = 5$$

$$\text{Gradient of the radius} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{0 - 7}{1 + 4} = \frac{-7}{5}$$

$$\text{Gradient of tangent} = \frac{-1}{5} \times M = -1$$

$$= \frac{-7m}{5} = -1$$

$$-7m = -5$$

$$m = \frac{5}{7}$$

$$\text{Equation of tangent to the circle} = y - y_1 = m(x - x_1)$$

$$y - y_1 = \frac{5}{7}(x - x_1)$$

$$\text{Sub } P(1, 0) : y - 0 = \frac{5}{7}(x - 1)$$

$$y = \frac{5x}{7} - \frac{5}{7} + 0$$

$$\therefore y = \frac{5x}{7} - \frac{5}{7}$$

1. Find the equation of the tangent at the point $(1, 0)$ on the circle: $x^2 + y^2 - 5x - y + 4 = 0$

Solution.

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

$$x^2 + y^2 - 5x - y = -4$$

$$x^2 - 5x + 2^2 + y^2 - y + 1^2 = -4$$

$$(x - 2.5)^2 + (y - 0.5)^2 = -4 + 5 + 1$$

$$2gxc = -5xc$$

$$g = \frac{-5}{2}$$

$$2fy = -y$$

$$f = \frac{-1}{2}$$

Centre = $(-\frac{5}{2}, -\frac{1}{2})$

Gradient of the radius = $\frac{y_2 - y_1}{x_2 - x_1}$

$$= \frac{0 + \frac{1}{2}}{1 + \frac{5}{2}} = \frac{\frac{1}{2}}{\frac{7}{2}} = \frac{1}{7}$$

$$M_r = \frac{1}{7}$$

Gradient of tangent = $\frac{1}{M} \times M = -1$

$$M = -1$$

$$M = -7$$

Equation of tangent to the circle: $y - y_1 = M(x - x_1)$

$$y - y_1 = -7(x - x_1)$$

Sub P(1, 0): $y - 0 = -7(x - 1)$

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

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

$$\therefore y = -7x + 7$$