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Computer Science

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

solution

$$x^2 + y^2 - 5x - y + 4 = 0$$

$$x^2 - 5x + y^2 - y + 4 = 0$$

$$(x - \frac{5}{2})^2 - \frac{25}{4} + (y - \frac{1}{2})^2 - \frac{1}{4} + 4 = 0$$

$$(x - \frac{5}{2})^2 + (y - \frac{1}{2})^2 = \frac{5}{2}$$

centre $(\frac{5}{2}, \frac{1}{2})$ radius $\sqrt{\frac{5}{2}}$

$$\text{gradient of the circle} = \frac{0 - \frac{1}{2}}{1 - \frac{5}{2}} = \frac{-\frac{1}{2}}{-\frac{3}{2}}$$

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

$$\text{gradient of the tangent} = -3$$

$$\text{Recall } y - y_1 = m(x - x_1)$$

$$\therefore \text{equation of the tangent is } y - 0 = -3(x - 1)$$

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

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

solution

$$x^2 + y^2 - 12x - 12y + 47 = 0$$

$$x^2 - 12x + y^2 - 12y + 47 = 0$$

$$(x - 6)^2 - 36 + (y - 6)^2 - 36 + 47 = 0$$

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

centre $(6, 6)$, radius $= \sqrt{25} = 5$

$$\text{gradient of the circle} = \frac{0 - 6}{1 - 6} = \frac{-6}{-5} = \frac{6}{5}$$

$$\text{gradient of the tangent} = -\frac{5}{6}$$

$$\text{Recall } y - y_1 = m(x - x_1)$$

$$\therefore \text{equation of the tangent is } y - 0 = -\frac{5}{6}(x - 1)$$

$$z \text{ by } = -50c + 5$$

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

solution

$$x^2 - 8x + y^2 + 14y + 40 = 0$$

$$(x - 4)^2 - 16 + (y + 7)^2 - 49 + 40 = 0$$

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

$$\text{centre } (4, -7) \text{ radius} = \sqrt{25} = 5$$

$$\begin{aligned} \text{gradient of the circle} &= \frac{0 - (-7)}{1 - 4} = \frac{0 + 7}{1 - 4} \\ &= \frac{7}{-3} \end{aligned}$$

$$\text{gradient of the tangent} = \frac{3}{7}$$

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

$$\therefore \text{equation of the tangent is } y - 0 = \frac{3}{7}(x - 1)$$

$$7y = 3x - 3$$