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COMPUTER SCIENCE MAT 102

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

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

Comparing the given equation to $x^2 + y^2 + 2gx + 2fy + c$

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

$$g = -5/2$$

$$\frac{\cancel{2}f\cancel{y}}{\cancel{2}\cancel{y}} = \frac{-\cancel{y}}{2\cancel{y}}$$

$$f = -1/2$$

$$(x_1, y_1) = (1, 0)$$

Using equation of the tangent at point (1,0)

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

where $m = \frac{-(x_1 + g)}{y_1 + f}$

$$y - y_1 = \left[\frac{-(x_1 + g)}{y_1 + f}\right](x - x_1)$$

$$y - 0 = \left[\frac{-(1 + (-5/2))}{0 + (-1/2)}\right](x - 1)$$

$$y = \left[\frac{-1 - 5/2}{-1/2}\right](x-1)$$

$$y = \left[\left\{-\left(\frac{1}{1} - \frac{5}{2}\right)\right\} \div -\frac{1}{2}\right](x-1)$$

$$y = \left[+\left(\frac{2-5}{2}\right) \times \frac{2}{+1}\right]$$

$y = -3(x-1)$ $\therefore$ $y = -3x + 3$

$y + 3x - 3 = 0$

$\therefore$ Equation of the tangent $= y + 3x - 3 = 0$

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

Comparing the given equation to $x^2 + y^2 + 2gx + 2fy + c = 0$

$$\frac{2gx}{2x} = \frac{-12x}{2x}$$

$g = -6$

$$\frac{2fy}{2y} = \frac{-12y}{2y}$$

$f = -6$

$(x_1, y_1) = (1, 0)$

Using equation of tangent at point $(1, 0)$

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

where $m = -\dfrac{(x_1 + g)}{y_1 + f}$

$$m = \frac{-(1+(-6)}{(0+(-6)}$$

$$m = \frac{-(1-6)}{-6}$$

$$m = \frac{+(-5)}{+6}$$

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

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

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

$$y = \cancel{-5x+5} \; -5x + \frac{5}{6}$$ Cross multiply

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

$$6y + 5x - 5 = 0$$

$\therefore$ Equation of the tangent $= 6y + 5x - 5 = 0$

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

Comparing the given equation to $x^2 + y^2 + 2gx + 2fy + c = 0$

$$\frac{\cancel{2}g\cancel{x}}{\cancel{2x}} = \frac{-\overset{4}{\cancel{8}}\cancel{x}}{\cancel{2x}}$$

$$g = -4$$

$$\frac{\cancel{2}f\cancel{y}}{\cancel{2y}} = \frac{\overset{7}{\cancel{14}}\cancel{y}}{\cancel{2y}}$$

$$f = 7.$$

$(x_1, y_1) = (1, 0)$

using equation of the tangent at point $(1, 0)$

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

where $m = \dfrac{-(x_1 + g)}{y_1 + f}$

$m = \dfrac{-(1 + (-4))}{(0 + 7)} = \dfrac{-(1 + 4)}{7} = -\dfrac{(-3)}{7} = \dfrac{3}{7}$

$m = 3/7$

$y - (0) = 3/7 (x - 1)$

$y = 3x/7 - 3/7 = 3x - 3/7$

$y \cancel{=} 3x - 3/7 = 7y = 3x - 3$

$7y - 3x + 3 = 0$

$\therefore$ Equation of the tangent $= 7y - 3x + 3 = 0$