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1 $x - y - 14 = 0$ and $x^2 + y^2 - 6x + 8y = 0$

Solution

$$x - y - 14 = 0 \quad \cdots (1)$$

$$x^2 + y^2 - 6x + 8y = 0 \quad (2)$$

from (1)

$$x = y + 14 \quad (3)$$

Put $y + 14$ for x in (2)

$$x^2 + y^2 - 6x + 8y = 0$$

$$(y+14)^2 + y^2 - 6(y+14) + 8y = 0$$

$$y^2 + 28y + 196 + y^2 - 6y - 84 + 8y = 0$$

$$y^2 + y^2 + 28y - 6y + 8y + 196 - 84 = 0$$

$$2y^2 + 30y + 112 = 0$$

divide through by 2

$$y^2 + 15y + 56 = 0$$

$$y^2 + 8y + 7y + 56 = 0$$

$$y(y+8) + 7(y+8) = 0$$

$$(y+7)(y+8) = 0$$

$$y = -7 \text{ or } y = -8$$

Substitute y in (3)

$x = y + 14$

when $y = -7$

$x = -7 + 14$

$x = 7$

when $y = -8$

$x = -8 + 14$

$x = 6$

Therefore the points are $(7, -7)$ and $(6, -8)$

2 $2x + y - 10 = 0$ ... ①

$x^2 + y^2 + 4x - 6y = 0$ .. ②

from ①

$y = -2x + 10$ ③

put $-2x + 10$ for y in ②

$x^2 + (-2x+10)^2 + 4x - 6(-2x+10) = 0$

$x^2 + 4x^2 - 40x + 100 + 4x + 12x - 60 = 0$

$x^2 + 4x^2 - 40x + 4x + 12x + 100 - 60 = 0$

$5x^2 - 24x + 40 = 0$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$a = 5 \quad b = -24 \quad c = 40$

$$\frac{-(-24) \pm \sqrt{(-24)^2 - 4(5 \times 40)}}{2 \times 5}$$

$$\frac{24 \pm \sqrt{576 - 800}}{10}$$

They do not intersect eachother

3 $x - 5y - 2 = 0$ ... (1)

$x^2 + 25y^2 - 6xy - 16 = 0$ ... (2)

from (1)

$x = 5y + 2$ (3)

Put $5y + 2$ for x in (2)

$(5y+2)^2 + 25y^2 - 6(5y+2)y - 16 = 0$

$25y^2 + 10y + 10y + 4 + 25y^2 - 30y^2 - 12y - 16 = 0$

$25y^2 + 25y^2 - 30y^2 + 20y - 12y + 4 - 16 = 0$

$20y^2 + 8y - 12 = 0$

divide through by 4

~~$4y^2 + 4$~~ $5y^2 + 2y - 3 = 0$

$5y^2 + 5y - 3y - 3 = 0$

$5y(y+1) - 3(y+1) = 0$

$(5y - 3)(y+1) = 0$

$5y = 3$ $\quad y = -1$

$y = 3/5$

Put values of y in (3)

$x = 5y + 2$

when $y = 3/5$ $\quad$ when $y = -1$

$x = 5 \cdot 3/5 + 2$ $\quad x = 5(-1) + 2$

$= 5$ $\quad x = -5 + 2$

$x = -3$

The points of intersection are: $(5, 3/5)$ $(-3, -1)$