

Simultaneous Equations : 2 : Answers.

1) $y = 10x^2 - 5x - 2$ — (1)
 $y = 2x - 3$ — (2)

sub (2) into (1)

$$2x - 3 = 10x^2 - 5x - 2$$

$$0 = 10x^2 - 7x + 1$$

$$0 = (5x - 1)(2x - 1)$$

either

or

$$5x - 1 = 0$$

$$2x - 1 = 0$$

$$x = \frac{1}{5}$$

$$x = \frac{1}{2}$$

(2)
 $\Rightarrow$

$$y = 2\left(\frac{1}{5}\right) - 3$$

$$y = 2\left(\frac{1}{2}\right) - 3$$

$$y = \frac{2}{5} - \frac{15}{5}$$

$$y = 1 - 3$$

$$y = -\frac{13}{5}$$

$$y = -2$$

$$\left. \begin{array}{l} x = \frac{1}{5} \\ y = -\frac{13}{5} \end{array} \right\} \text{Ans}$$

$$\left. \begin{array}{l} x = \frac{1}{2} \\ y = -2 \end{array} \right\} \text{Ans}$$

2) $y - 3 = 2x$ — (1)
 $y + 7 = x^2 - x$ — (2)

~~1~~ (1) $\Rightarrow y = 2x + 3$ (*)

Sub into (2) $\Rightarrow 2x + 3 + 7 = x^2 - x$

$$0 = x^2 - 3x - 10$$

$$0 = (x - 5)(x + 2)$$

either

or

$$x - 5 = 0$$

$$x + 2 = 0$$

$$x = 5$$

$$x = -2$$

from (*) $\downarrow$

$\downarrow$

$$y = 2(5) + 3$$

$$y = 2(-2) + 3$$

$$y = 13$$

$$y = -4 + 3$$

$$y = -1$$

$$\left\{ \begin{array}{l} x = 5 \\ y = 13 \end{array} \right\} \text{Ans}$$

$$\left\{ \begin{array}{l} x = -2 \\ y = -1 \end{array} \right\} \text{Ans.}$$

$$3) \quad \begin{aligned} x^2 + y^2 &= 25 & - (1) \\ 2y + x &= 10 & - (2) \end{aligned}$$

$$(2) \Rightarrow x = 10 - 2y \quad (*)$$

$$\text{sub into (1)} \Rightarrow (10 - 2y)^2 + y^2 = 25$$

$$100 - 40y + 4y^2 + y^2 = 25$$

$$5y^2 - 40y + 75 = 0$$

$$y^2 - 8y + 15 = 0$$

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

$$\text{either } y - 5 = 0 \text{ or } y - 3 = 0$$

$$y = 5$$

$$y = 3$$

(*)

↓

↓

$$x = 10 - 2(5)$$

$$x = 10 - 2(3)$$

$$x = 0$$

$$x = 4$$

$$\left. \begin{aligned} y &= 5 \\ x &= 0 \end{aligned} \right\} \text{ANS}$$

$$\left. \begin{aligned} x &= 4 \\ y &= 3 \end{aligned} \right\} \text{ANS}$$

$$4) \quad \begin{aligned} y &= x & - (1) \\ y^2 &= 4x & - (2) \end{aligned}$$

$$(2) \Rightarrow x^2 = 4x$$

$$x^2 - 4x = 0$$

$$x(x - 4) = 0$$

either

or

$$x - 4 = 0$$

$$x = 0$$

$$x = 4$$

(1)

↓

↓

$$y = 0$$

$$y = 4$$

$$\left. \begin{aligned} x &= 0 \\ y &= 0 \end{aligned} \right\} \text{ANS}$$

$$\left. \begin{aligned} x &= 4 \\ y &= 4 \end{aligned} \right\} \text{ANS}$$

$$5) \quad xy = 64 \quad - (1)$$

$$4x - y = 60 \quad - (2)$$

$$(2) \Rightarrow 4x - 60 = y \quad (*)$$

sub into (1)

$$x(4x - 60) = 64$$

$$4x^2 - 60x = 64$$

$$4x^2 - 60x - 64 = 0$$

$$x^2 - 15x - 16 = 0$$

$$(x - 16)(x + 1) = 0$$

either

$$x - 16 = 0$$

$$x = 16$$

(*)



$$4(16) - 60 = y$$

$$64 - 60 = y$$

$$4 = y$$

$$x = 16 \quad y = 4 \quad \text{ANS}$$

or

$$x + 1 = 0$$

$$x = -1$$



$$4(-1) - 60 = y$$

$$-4 - 60 = y$$

$$-64 = y$$

$$x = -1 \quad y = -64 \quad \text{ANS}$$

$$6) \quad x - 3y = 8 \quad - (1)$$

$$x^2 - 3y^2 = 22 \quad - (2)$$

$$(1) \Rightarrow x = 8 + 3y \quad (*)$$

$$(2) \Rightarrow (8 + 3y)^2 - 3y^2 = 22$$

$$64 + 48y + 9y^2 - 3y^2 = 22$$

$$6y^2 + 48y + 42 = 0$$

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

$$(y + 7)(y + 1) = 0$$

either

$$y + 7 = 0$$

$$y = -7$$

(*)



$$x = 8 + 3(-7)$$

$$x = 8 - 21$$

$$x = -13$$

$$x = -13 \quad y = -7 \quad \text{ANS}$$

$$\text{or } y + 1 = 0$$

$$y = -1$$



$$x = 8 + 3(-1)$$

$$x = 8 - 3$$

$$x = 5$$

$$x = 5 \quad y = -1 \quad \text{ANS}$$

$$7) \quad \begin{aligned} 2x - 5y &= 3 & - (1) \\ 2xy + y^2 &= 9 & - (2) \end{aligned}$$

$$(1) \Rightarrow 2x = 3 + 5y \quad (*)$$

$$(2) \Rightarrow (3 + 5y)y + y^2 = 9$$

$$3y + 5y^2 + y^2 = 9$$

$$6y^2 + 3y - 9 = 0$$

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

$$(2y + 3)(y - 1) = 0$$

$$\text{either } 2y + 3 = 0 \quad \text{or } y - 1 = 0$$

$$y = -\frac{3}{2}$$

$$y = 1$$

(*)



$$2x = 3 + 5\left(-\frac{3}{2}\right)$$

$$2x = 3 + 5(1)$$

$$2x = \frac{6}{2} - \frac{15}{2}$$

$$2x = 8$$

$$x = 4$$

$$2x = -\frac{9}{2}$$

$$x = -\frac{9}{4}$$

$$\left. \begin{aligned} x &= -\frac{9}{4} \\ y &= -\frac{3}{2} \end{aligned} \right\} \text{ANS}$$

$$\left. \begin{aligned} x &= 4 \\ y &= -\frac{3}{2} \end{aligned} \right\} \text{ANS}$$

$$8) \quad \begin{aligned} 2x - 3y &= 3 & - (1) \\ 2x^2 + 3y^2 &= 21 & - (2) \end{aligned}$$

$$(1) \Rightarrow \begin{aligned} 2x &= 3 + 3y \\ x &= \frac{3 + 3y}{2} \end{aligned} \quad (*)$$

$$(2) \Rightarrow 2 \frac{(3 + 3y)^2}{4} + 3y^2 = 21$$

$$\frac{(3 + 3y)^2}{2} + 3y^2 = 21$$

x2

$$(3 + 3y)^2 + 6y^2 = 42$$

$$9 + 18y + 9y^2 + 6y^2 = 42$$

$$15y^2 + 18y - 33 = 0$$

$$5y^2 + 6y - 11 = 0$$

$$(5y + 11)(y - 1) = 0$$

$$\text{either } 5y + 11 = 0 \quad \text{or } y - 1 = 0$$

$$y = -\frac{11}{5}$$

$$y = 1$$

(*)



$$x = \frac{3 + 3\left(-\frac{11}{5}\right)}{2}$$

$$x = \frac{3 + 3(1)}{2}$$

$$x = \frac{9}{5}$$

$$x = 3$$

$$\left. \begin{aligned} x &= \frac{9}{5} \\ y &= -\frac{11}{5} \end{aligned} \right\} \text{ANS}$$

$$\left. \begin{aligned} x &= 3 \\ y &= 1 \end{aligned} \right\} \text{ANS}$$

$$9) \quad \begin{aligned} 2x + 3y &= 8 & - (1) \\ x^2 + y^2 &= 5 & - (2) \end{aligned}$$

$$(1) \Rightarrow \begin{aligned} 2x &= 8 - 3y \\ x &= \frac{(8 - 3y)}{2} \quad (*) \end{aligned}$$

$$(2) \Rightarrow \frac{(8 - 3y)^2}{4} + y^2 = 5$$

$$\begin{aligned} \times 4 \quad (8 - 3y)^2 + 4y^2 &= 20 \\ 64 - 48y + 9y^2 + 4y^2 &= 20 \\ 13y^2 - 48y + 44 &= 0 \\ (13y - 22)(y - 2) &= 0 \end{aligned}$$

$$\text{either } y = \frac{22}{13} \quad \text{or} \quad y = 2$$

$$\begin{aligned} (*) \quad \downarrow \\ x &= \frac{8 - 3\left(\frac{22}{13}\right)}{2} \\ x &= \frac{104 - 66}{13} \\ x &= \frac{38}{13} \end{aligned}$$

$$\begin{aligned} \downarrow \\ x &= \frac{8 - 3(2)}{2} \\ x &= 1 \end{aligned}$$

$$\left. \begin{aligned} x &= 1 \\ y &= 2 \end{aligned} \right\} \text{Ans}$$

$$\begin{aligned} x &= \frac{38}{13} \\ x &= \frac{19}{13} \end{aligned}$$

$$\left. \begin{aligned} x &= \frac{19}{13} \\ y &= \frac{22}{13} \end{aligned} \right\} \text{Ans.}$$

$$10) \quad \begin{aligned} 3x - 2y &= 4 & - (1) \\ x^2 - y^2 &= 3 & - (2) \end{aligned}$$

$$(1) \Rightarrow \begin{aligned} 3x &= 4 + 2y \\ x &= \frac{(4 + 2y)}{3} \quad (*) \end{aligned}$$

$$(2) \Rightarrow \frac{(4 + 2y)^2}{9} - y^2 = 3$$

$$\begin{aligned} \times 9 \quad (4 + 2y)^2 - 9y^2 &= 27 \\ 16 + 16y + 4y^2 - 9y^2 &= 27 \\ 0 &= 5y^2 - 16y + 11 \\ 0 &= (5y - 11)(y - 1) \end{aligned}$$

$$\text{either } y = \frac{11}{5} \quad \text{or} \quad y = 1$$

$$x = \frac{4 + 2\left(\frac{11}{5}\right)}{3}$$

$$x = \frac{42}{15}$$

$$\left. \begin{aligned} x &= 42/15 \\ y &= 11/5 \end{aligned} \right\} \text{Ans}$$

$$\downarrow \\ x &= \frac{4 + 2(1)}{3}$$

$$x = 2$$

$$\left. \begin{aligned} x &= 2 \\ y &= 1 \end{aligned} \right\} \text{Ans}$$