

Systems of Equations

Linear

Substitution

$$\begin{aligned} 1) \quad & y = 2x - 1 \\ & y + x = 11 \end{aligned}$$

$$\begin{aligned} (2x-1) + x &= 11 \\ 3x - 1 &= 11 \\ 3x &= 12 \\ x &= 4 \end{aligned}$$

$$\begin{aligned} y &= 2(4) - 1 \\ y &= 7 \end{aligned} \quad (4, 7)$$

$$\begin{aligned} (x+2y &= -2) \cdot -2 \\ 2x - 3y &= 6 \end{aligned}$$

Elimination

$$\begin{array}{r} -2x - 4y = 4 \\ 2x - 3y = 6 \\ \hline -7y = 10 \\ y = \frac{-10}{7} \end{array}$$

$$\begin{aligned} x + 2\left(\frac{-10}{7}\right) &= -2 \\ x - \frac{20}{7} &= -2 \\ x &= \frac{6}{7} \end{aligned}$$

~~(6, 6)~~

$$\left(\frac{6}{7}, \frac{-10}{7}\right)$$

Non-Linear

1) $y = 2x+1$
 $2x + y^2 = 1$

$$2x + (2x+1)^2 = 1$$

$$2x + (4x^2 + 4x + 1) = 1$$

$$4x^2 + 6x + 1 = 1$$

$$4x^2 + 6x = 0$$

$$2x(2x+3) = 0$$

$$2x = 0 \quad 2x+3 = 0$$

$$x = 0 \quad 2x = -3$$

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

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

$$y = 1$$

$$(0, 1)$$

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

$$y = -3 + 1$$

$$y = -2$$

$$\left(-\frac{3}{2}, -2\right)$$

$$(2x+1)(2x+1)$$

FOIL

	2x	1
2x		
1		

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

$$\begin{array}{r} 2x^2 + 2xy = 10 \\ 6x^2 - 2xy = 4 \\ \hline 8x^2 = 14 \\ x^2 = \frac{14}{8} \end{array}$$

$$x^2 = \frac{7}{4}$$

$$x = \pm \sqrt{\frac{7}{4}}$$

$$x = \pm 1.3$$

$$\begin{aligned} 2(1.3)^2 + 2(1.3)y &= 10 \\ 3.38 + 2.6y &= 10 \\ 2.6y &= 6.62 \\ y &= 2.5 \end{aligned}$$

$$(1.3, 2.5)$$

$$\begin{aligned} 2(-1.3)^2 + 2(-1.3)y &= 10 \\ 3.38 - 2.6y &= 10 \\ -2.6y &= 6.62 \\ y &= -2.5 \end{aligned}$$

$$(-1.3, -2.5)$$