

1. Solve, using the method of substitution, the system  $\begin{cases} -x + 4y = 19 \\ x = -2y + 5 \end{cases}$ .

1. The equation  $x = -2y + 5$  is already solved for  $x$ .

2. Substitute into  $-x + 4y = 19$

$$\begin{aligned} -x + 4y &= 19 \\ -(-2y + 5) + 4y &= 19 \\ 2y - 5 + 4y &= 19 \\ 6y &= 24 \\ y &= 4 \end{aligned}$$

3. Back-substitute into  $x = -2y + 5$ .

$$\begin{aligned} x &= -2(4) + 5 \\ x &= -3 \end{aligned}$$

4. Check  $(-3, 4)$  in both original equations.

$$\begin{array}{ll} -x + 4y = 19? & x = -2y + 5? \\ -(-3) + 4(4) = 19? & -3 = -2(4) + 5? \\ 3 + 16 = 19 \checkmark & -3 = -8 + 5 \checkmark \end{array}$$

The solution to the system is  $(-3, 4)$

2. Solve, using the method of substitution, the system  $\begin{cases} 2x - 3y = 7 \\ 3x + 6y = 0 \end{cases}$ .

1. Solve  $3x + 6y = 0$  for  $x$ .

$$\begin{aligned} 3x + 6y &= 0 \\ 3x &= -6y \\ x &= -2y \end{aligned}$$

2. Substitute into  $2x - 3y = 7$

$$\begin{aligned} 2x - 3y &= 7 \\ 2(-2y) - 3y &= 7 \\ -7y &= 7 \\ y &= -1 \end{aligned}$$

3. Back-substitute into  $x = -2y$ .

$$\begin{aligned} x &= -2(-1) \\ x &= 2 \end{aligned}$$

4. Check  $(2, -1)$  in both original equations.

$$\begin{array}{ll} 2x - 3y = 7? & 3x + 6y = 0? \\ 2(2) - 3(-1) = 7? & 3(2) + 6(-1) = 0? \\ 4 + 3 = 7 \checkmark & 6 - 6 = 0 \checkmark \end{array}$$

The solution to the system is  $(2, -1)$

3. Solve, using the addition method, the system  $\begin{cases} 2x - 3y = 19 \\ 3x + 6y = -3 \end{cases}$ .

$$\begin{aligned} \begin{cases} 2x - 3y = 19 \\ 3x + 6y = -3 \end{cases} &\Rightarrow \begin{cases} 2(2x - 3y) = 2(19) \\ 3x + 6y = -3 \end{cases} \Rightarrow \begin{array}{rcl} \begin{cases} 4x - 6y = 38 \\ 3x + 6y = -3 \end{cases} & \Rightarrow & \begin{array}{rcl} 4x - 6y & = & 38 \\ 3x + 6y & = & -3 \\ \hline 7x & & = 35 \\ x & = & 5 \end{array} \end{array}$$

Back-substitute into  $3x + 6y = -3$ .

$$\begin{aligned} 3(5) + 6y &= -3 \\ 6y &= -18 \\ y &= -3 \end{aligned}$$

Check  $(5, -3)$  in **both original** equations.

$$\begin{array}{ll} 2x - 3y = 19? & 3x + 6y = -3? \\ 2(5) - 3(-3) = 19? & 3(5) + 6(-3) = -3? \\ 10 + 9 = 19 \checkmark & 15 - 18 = -3 \checkmark \end{array}$$

The solution to the system is  $(5, -3)$ .

4. Solve, using the elimination method, the system  $\begin{cases} \frac{x}{3} + \frac{2y}{3} = 2 \\ -2x + \frac{y}{2} = 15 \end{cases}$ .

$$\begin{aligned} \begin{cases} \frac{x}{3} + \frac{2y}{3} = 2 \\ -2x + \frac{y}{2} = 15 \end{cases} &\Rightarrow \begin{cases} 3\left(\frac{x}{3} + \frac{2y}{3}\right) = 3(2) \\ 2\left(-2x + \frac{y}{2}\right) = 2(15) \end{cases} \Rightarrow \begin{cases} x + 2y = 6 \\ -4x + y = 30 \end{cases} \Rightarrow \begin{cases} 4(x + 2y) = 4(6) \\ -4x + y = 30 \end{cases} \\ &\Rightarrow \begin{array}{r} 4x + 8y = 24 \\ -4x + y = 30 \\ \hline 9y = 54 \\ y = 6 \end{array} \end{aligned}$$

Back-substitute into  $x + 2y = 6$ .

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

Check  $(-6, 6)$  in **both original** equations.

$$\begin{array}{ll} \frac{x}{3} + \frac{2y}{3} = 2? & -2x + \frac{y}{2} = 15? \\ \frac{-6}{3} + \frac{2(6)}{3} = 2? & -2(-6) + \frac{6}{2} = 15? \\ -2 + 4 = 2 \checkmark & 12 + 3 = 15 \checkmark \end{array}$$

The solution to the system is  $(-6, 6)$ .

5. Solve, using the elimination method, the system  $\begin{cases} y = 5x + 82 \\ x = -2y + 54 \end{cases}$ .

$$\begin{cases} y = 5x + 82 \\ x = -2y + 54 \end{cases} \Rightarrow \begin{cases} -5x + y = 82 \\ x + 2y = 54 \end{cases} \Rightarrow \begin{cases} -5x + y = 82 \\ 5(x + 2y) = 5(54) \end{cases} \Rightarrow \begin{array}{r} \begin{cases} -5x + y = 82 \\ 5x + 10y = 270 \end{cases} \\ \hline 11y = 352 \\ y = 32 \end{array}$$

Back-substitute into  $x = -2y + 54$ .

$$\begin{aligned} x &= -2(32) + 54 \\ x &= -10 \end{aligned}$$

Check  $(-10, 32)$  in both original equations.

$$\begin{array}{ll} y = 5x + 82? & x = -2y + 54? \\ 32 = 5(-10) + 82? & -10 = -2(32) + 54? \\ 32 = -50 + 82 \checkmark & -10 = -64 + 54 \checkmark \end{array}$$

The solution to the system is  $(-10, 32)$ .