

## Solve More Linear Systems By Elimination

**Starter Problem 1: Solve the linear system with elimination:**

$$-1(4x - 9y) = -21(-1)$$

$$4x = -3y - 9 \rightarrow 4x + 3y = -9$$

$$-4x + 9y = 21$$

$$+ 4x + 3y = -9$$

$$\hline 12y = 12$$

$$y = 1$$

$$4x = -3(1) - 9$$

$$4x = -3 - 9$$

$$4x = -12$$

$$x = -3$$

$$\boxed{(-3, 1)}$$

**Starter Problem 2:**

$$5x + 2y = 16$$

$$3x - 4y = 20$$

Would it be possible to use elimination to solve the system above using elimination?

Only if we multiply the top eqn by 2

What would you have to do in order to use elimination? Mult. top eqn by 2

Solve the system:  $2(5x + 2y) = 16 \cdot 2$

$$10x + 4y = 32$$

$$+ 3x - 4y = 20$$

$$\hline 13x = 52$$

$$x = 4$$

$$5(4) + 2y = 16$$

$$20 + 2y = 16$$

$$2y = -4$$

$$y = -2$$

$$\boxed{(4, -2)}$$

**Steps to solve linear systems by ELIMINATION:**

**GOAL – to have either the  $x$  or the  $y$  terms with the same number but opposite signs!**

- 1) Identify the variable to eliminate: Which would be easiest to get to the same number but opposite signs?
- 2) If we need to change the numeric portion, multiply one (or both) equations by the appropriate numbers – remember the goal is opposite signs
- 3) Add the 2 equations together to eliminate one set of variables.
- 4) Solve for the remaining variable.
- 5) Substitute this value into one of the original equations to find the eliminated variable.
- 6) Check the solution and write as a set of ordered pairs  $(x, y)$ .

EXAMPLES:

1.  $2(3x-2y) = 3 \cdot 2$   
 $-4x + 4y = 4$

$$\begin{array}{r} 6x - 4y = 6 \\ -4x + 4y = 4 \\ \hline 2y = 10 \\ y = 5 \end{array}$$

$$\begin{array}{r} -4(5) + 4y = 4 \\ -20 + 4y = 4 \\ 4y = 24 \\ y = 6 \end{array}$$

$$x = 5$$

$$y = 6$$

$$\boxed{(5, 6)}$$

2.  $-2(4x-3y) = 8(-2)$   
 $3(5x-2y) = -11(3)$

$$\begin{array}{r} -8x + 6y = -16 \\ 15x - 6y = -33 \\ \hline 7x = -49 \end{array}$$

$$x = -7$$

$$\begin{array}{r} 4(-7) - 3y = 8 \\ -28 - 3y = 8 \\ -3y = 36 \\ y = -12 \end{array}$$

$$\boxed{(-7, -12)}$$

3.  $-5(7x-6y) = -1(-5)$   
 $7(5x-4y) = 1(7)$

$$\begin{array}{r} -35x + 30y = 5 \\ + 35x - 28y = 7 \\ \hline 2y = 12 \\ y = 6 \end{array}$$

$$\begin{array}{r} 5x - 4(6) = 1 \\ 5x - 24 = 1 \\ 5x = 25 \\ x = 5 \end{array}$$

$$\boxed{(5, 6)}$$

4.  $-2(x+3y) = 8(-2)$   
 $2x + 6y = 10$

$$\begin{array}{r} -2x - 6y = -16 \\ + 2x + 6y = 10 \\ \hline 0 = -6 \end{array}$$

No Solution

↗ Switch

5.  $2(-x+2y) = 5(2)$   
 $2x - 4y = -10$

$$\begin{array}{r} -2x + 4y = 10 \\ + 2x - 4y = -10 \\ \hline 0 = 0 \end{array}$$

Infinite Solutions