

# Solving Systems of Linear Equations by Elimination

To use elimination, keep the equations in standard form

Look for the coefficients of the  $x$  or the  $y$  to be the same or opposites. (ex: 2 & -2), add your equations to Eliminate the variable. If they are the same (ex: 5 & 5) subtract your equations to Eliminate the variable.

If you cannot immediately add or subtract your equations, you can multiply one or both equations to make one of the pairs of coefficients opposite. Then you can eliminate.

When you find the value of  $x$  or  $y$ , you need to plug back into one of the original equations to complete the ordered pair

Examples:

$$\begin{array}{r} 1) \quad -2x - 8y = 10 \\ + \quad 2x - 6y = 18 \\ \hline \quad -4y = 28 \\ \quad \quad -4 \quad -4 \\ \hline \quad \quad y = -2 \end{array}$$

$$\begin{array}{r} 2x - 6(-2) = 18 \\ 2x + 12 = 18 \\ \quad -12 \quad -12 \\ \hline \quad \quad 2x = 6 \\ \quad \quad \quad 2 \quad 2 \\ \hline \quad \quad x = 3 \end{array}$$

$$(3, -2)$$

$$\begin{array}{r} 2) \quad -5x - 4y = -15 \\ + \quad -x + 4y = -3 \\ \hline \quad -6x = -18 \\ \quad \quad -6 \quad -6 \\ \hline \quad \quad x = 3 \end{array}$$

$$\begin{array}{r} -5(3) - 4y = -15 \\ -15 - 4y = -15 \\ \quad +15 \quad +15 \\ \hline \quad \quad -4y = 0 \end{array}$$

$$\begin{array}{r} -4y = 0 \\ \quad -4 \quad -4 \\ \hline \quad \quad y = 0 \end{array}$$

$$(3, 0)$$

$$\begin{array}{r} 3) \quad 2x - 3y = 8 \\ - \quad 2x + 3y = 4 \\ \hline \quad -6y = 4 \\ \quad \quad -6 \quad -6 \\ \hline \quad \quad y = -\frac{2}{3} \end{array}$$

$$\begin{array}{r} 2x + 3\left(-\frac{2}{3}\right) = 8 \\ 2x - 2 = 8 \\ \quad +2 \quad +2 \\ \hline \quad \quad 2x = 10 \end{array}$$

$$\begin{array}{r} 2x = 10 \\ \quad 2 \quad 2 \\ \hline \quad \quad x = 5 \end{array}$$

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

$$(5, -\frac{2}{3})$$

$$x = 5$$

$$4) \begin{cases} 3x + 6y = 6 \\ 9x - 12y = 18 \end{cases}$$

$$\begin{array}{r} 6x + 12y = 12 \\ + 9x - 12y = 18 \\ \hline \end{array}$$

$$\frac{15x}{15} = \frac{30}{15}$$

$$x = 2$$

$$(2, 0)$$

$$\begin{array}{r} 3(2) + 6y = 6 \\ 6 + 6y = 6 \\ -6 \quad -6 \\ \hline \end{array}$$

$$0y = 0$$

$$y = 0$$

$$5) \begin{cases} -2x + 4y = -6 \\ 2(-6x - 2y = -4) \end{cases}$$

$$\begin{array}{r} -2x + 4y = -6 \\ + -12x - 4y = -8 \\ \hline \end{array}$$

$$\frac{-14x}{-14} = \frac{-14}{-14}$$

$$x = 1$$

$$(1, -1)$$

$$\begin{array}{r} -6(1) - 2y = -4 \\ -6 - 2y = -4 \\ +6 \quad +6 \\ \hline \end{array}$$

$$-2y = 2$$

$$y = -1$$