Solving Systems of Equations:
Elimination

Recall: Solving a system of equations means finding the intersection of the lines.

Example 1:

$$\boldsymbol{x - y = 2}$$
$$\boldsymbol{x + y = 6}$$

Method of Elimination:

i.) Determine whether adding **OR** subtracting the two equations will eliminate one of the variables.

ii.) Solve for the variables

i.) In this example, ADDING the two equations will ELIMINATE the $\boldsymbol{y}$-variable.

$$\begin{array}{r} \boldsymbol{x - y = 2} \\ \underline{(+)\ \boldsymbol{x + y = 6}} \\ \boldsymbol{2x \qquad = 8} \end{array}$$

ii.) And now we solve for $\boldsymbol{x}$.

$$\boldsymbol{2x = 8}$$

$$\boldsymbol{x =} \_\_\_\_\_\_$$

iii.) Now, we know $\boldsymbol{x}$, we can solve for $\boldsymbol{y}$.

Therefore $\boldsymbol{y =}$ ______

But,what if **NEITHER** adding **NOR** subtracting the two equations will eliminate a variable?

Example 2:

$$\mathbf{4x + 7y = 13}$$
$$\mathbf{x + y = 1}$$

Neither adding nor subtracting the two equations will eliminate a variable, so we must first "**change**" one (or both) equation(s).

If the second equation is multiplied by $\mathbf{-4}$, then the $\boldsymbol{x}$-terms would be eliminated when we add the two together.

$$\mathbf{-4}(x + y) = \mathbf{-4}(1)$$

$$\mathbf{-4x - 4y = -4}$$

Now we can add this to the first original equation:

$$\begin{array}{r} \mathbf{4x + 7y = 13} \\ \underline{(+)\ \mathbf{-4x - 4y = -4}} \end{array}$$

$\boldsymbol{y} =$ ________

And now we can solve for $\boldsymbol{x}$.

$\boldsymbol{x} =$ _______

Therefore the solution to this system of equations is **(,   )**.

Solving Systems: Elimination Practice Problems

Solve each system using the elimination method.

1. $\boldsymbol{x + y = 10}$
   $\boldsymbol{x - y = 4}$

2. $\boldsymbol{x + y = 11}$
   $\boldsymbol{5x - 2y = 27}$