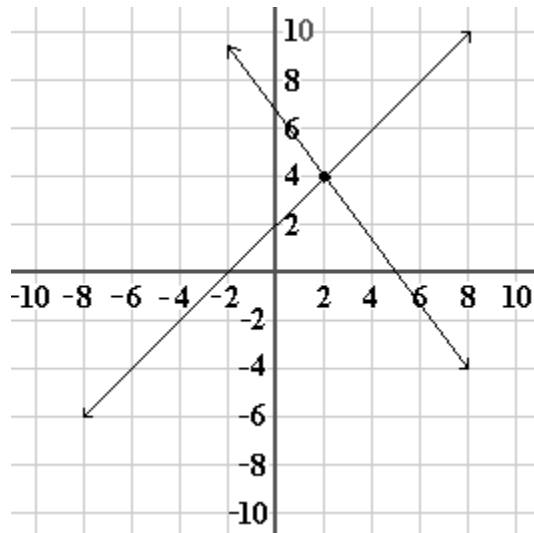


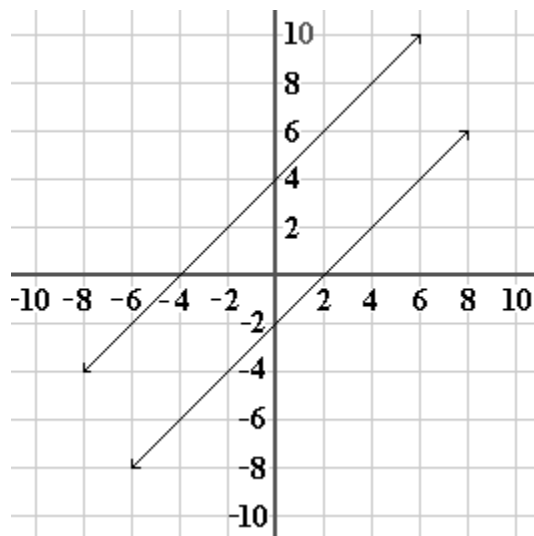
## Solving Systems Equations Graphically

A system of equations problem involves finding the solutions that satisfy the conditions set forth in two or more equations in two or more variables. When solving problems concerning systems of two linear equations and two variables there are three possible outcomes.

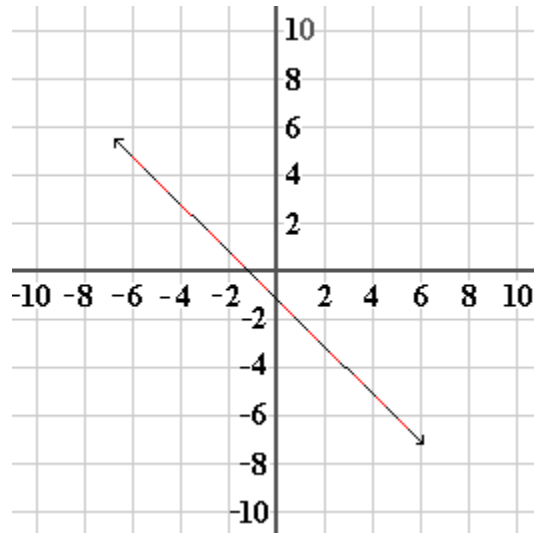
Consistent Systems - In this case, the graphs of the two lines intersect at exactly one point.



Inconsistent Systems - In this case the graphs of the two lines show that they are parallel.



Dependent Systems - In this case the graphs of the two lines indicate that there are infinite solutions because they are, in reality, the same line.



There are several methods that may be used to solve a system of equations problem.

- GRAPHING METHOD
- SUBSTITUTION METHOD
- ELIMINATION-BY-ADDITION METHOD

This section will go over the first method – solving the system of equations graphically. The other two methods will be covered in future sections.

Steps for solving a system of equations graphically:

1. Graph each equation on the same coordinate system
2. Look for the point(s) of intersection between the graphs of the equations
3. Check the solution in the original equations

**Example 1.** Solve the following system by the graphing method.

a.)  $x + y = 4$                       b.)  $x - y = 2$

**Solution:**

**Step 1: Convert both equations into the slope intercept form (by solving for y).**

a.)  $x + y = 4$                       b.)  $x - y = 2$   
 $y = -x + 4$                            $y = x - 2$

**Step 2: Graph both lines.**

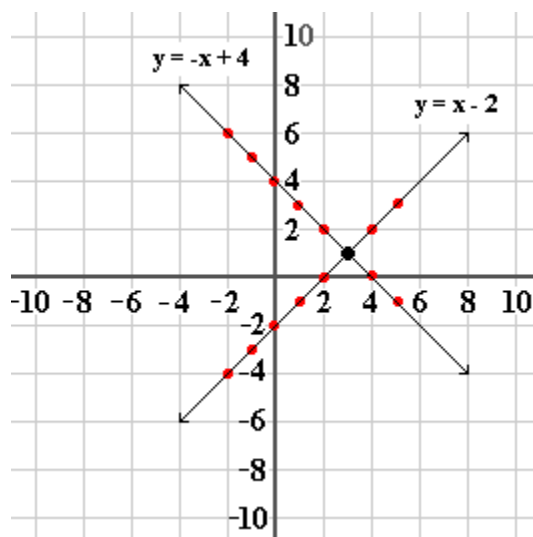
On the same coordinate system, graph both lines after determining and plotting several points.

a.)  $x + y = 4$

x	-2	-1	0	1	2	3	4	5
y	6	5	4	3	2	1	0	-1

b.)  $x - y = 2$

x	-2	-1	0	1	2	3	4	5
y	-4	-3	-2	-1	0	1	2	3



**Example 1 (Continued):****Step 3: Verify and check by substitution.**

The graph from step two indicates that the point of intersection is at (3, 1). This can be verified by substituting the values of  $x$  and  $y$  of the point into the two equations given.

$$\begin{array}{ll} \text{a.) } x + y = 4 & \text{b.) } x - y = 2 \\ 3 + 1 = 4 & 3 - 1 = 2 \\ 4 = 4 & 2 = 2 \end{array}$$