Algebra 2
Lesson 3.1 – Graphing Systems of Equations
Mrs. Snow, Instructor

Two or more linear equations form a **system of equations**. The solution to a system of equations is the common point of intersection. An easy way to find a solution to s system of equations is to graph both equations and locate the (x,y) coordinates where the two lines meet.

Example: Solve the system below by graphing.

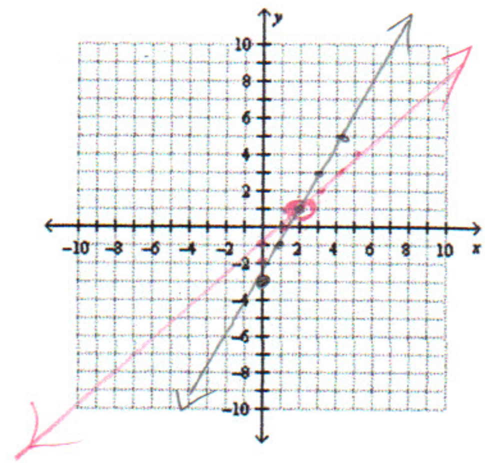
	slope ,	y-intercept
$y = 2x - 3$	$m = 2,$	$b = -3$
$y = x - 1$	$m = 1,$	$b = -1$

$m = \frac{y}{x} = \frac{2}{1}$

Remember the starting point is the y-incpt. and follow the slope.

Notice that the lines intersect at (2,1)

Solution to the system is (2,1)



- If you use a graphing calculator, press WINDOW and set as follows:
  x-axis - -10, 10, 1
  y-axis -- -10, 10, 1
- Now press ENTER and **Y=** and enter equations. Press **GRAPH**. Notice where both lines intersect.
- To find the exact point value on the calculator: Press **2nd Trace – 5**. Notice flashing star and equation name in upper left corner. Arrow over so that star is close to the desired intersection. **ENTER,** arrow star on second curve over close to the intersection, **ENTER** (guess)**ENTER** intersection given: x=2, y=1.

While use of the graphing calculator is nice to check your work, YOU ARE EXPECTED TO FIND THE GRAPHICAL SOLUTION THROUGH ACCURATE HAND GRAPHING AND WILL BE TESTED WITHOUT A CALCULATOR!!

Classification of Systems:

This type of system of equations is **independent** system, (because the solution is made up of two distinct lines).

Example: solve the system below by graphing.

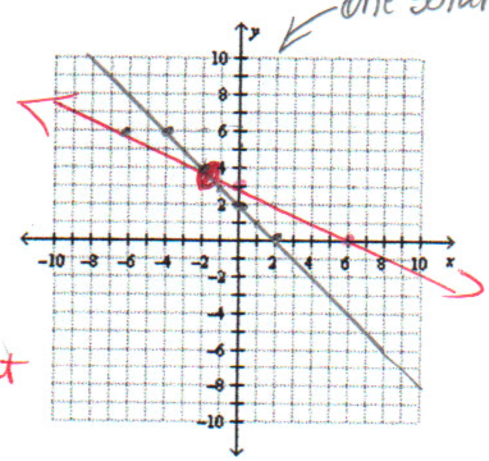
$$\begin{cases} 2x + 4y = 12 \\ x + y = 2 \end{cases}$$

(0, 3) (6, 0)

(0, 2) (2, 0)

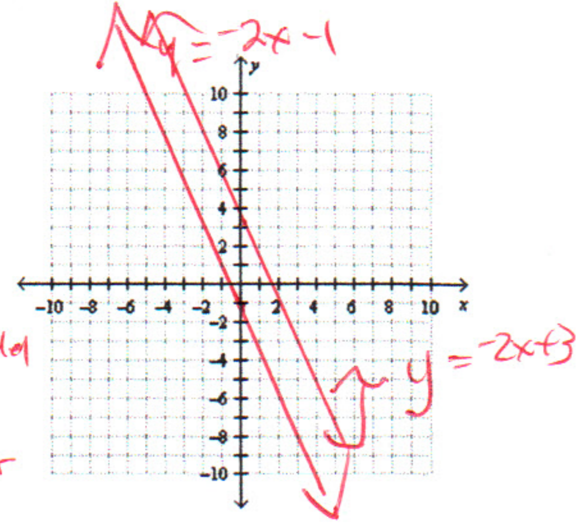
Independent ⇒ slopes different

one solution



Sometimes the two equations will not meet, that is they are parallel. In such cases the system has **NO** solution. We call this an **inconsistent** (no solution). Notice that the two lines will have the same slope but different y-intercepts.

Example: Solve the system below by graphing.



$$\begin{cases} y + 2x = -1 \\ y + 2x = 3 \end{cases}$$ rearrange into slope-intercept form

$$\left\{ \begin{array}{l} y = -2x - 1 \\ y = -2x + 3 \end{array} \right\}$$

$m = -2$

inconsistent – parallel

Slopes equal

Intercepts different

On occasion, a system of equations will graph the same line with two different equations. This would mean that the graph of one line is directly on top of the second graph and the two lines would intersect in an infinite number of places. That is they are graphically, the same line. We call this **dependent** (one line) and it has **infinite solutions.**

Example: solve the system of equations

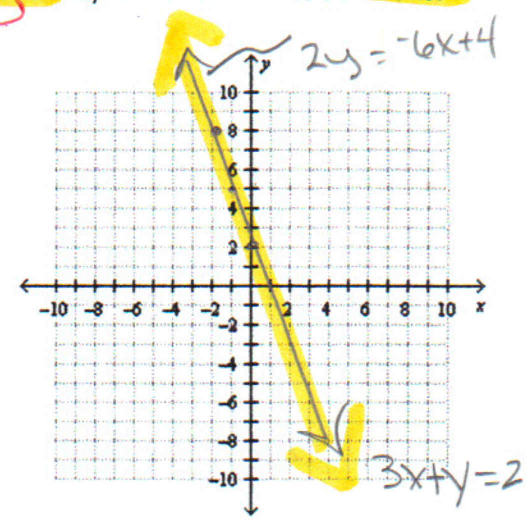
$$\begin{cases} 3x + y = 2 \\ 2y = -6x + 4 \end{cases}$$

$$\begin{cases} y = -3x + 2 \\ y = -3x + 2 \end{cases}$$

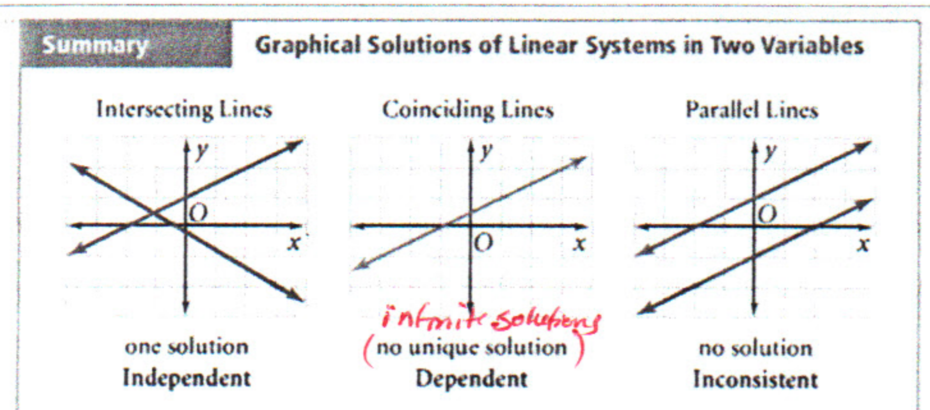
dependent:

slopes same

intercepts same



In summary we can classify systems of equations by the number of solutions:



Independent:	Dependent:	Inconsistent:
$m_1 \neq m_2$	$m_1 = m_2$ $b_1 = b_2$	$m_1 = m_2$ $b_1 \neq b_2$
one solution	infinite solutions	no solutions