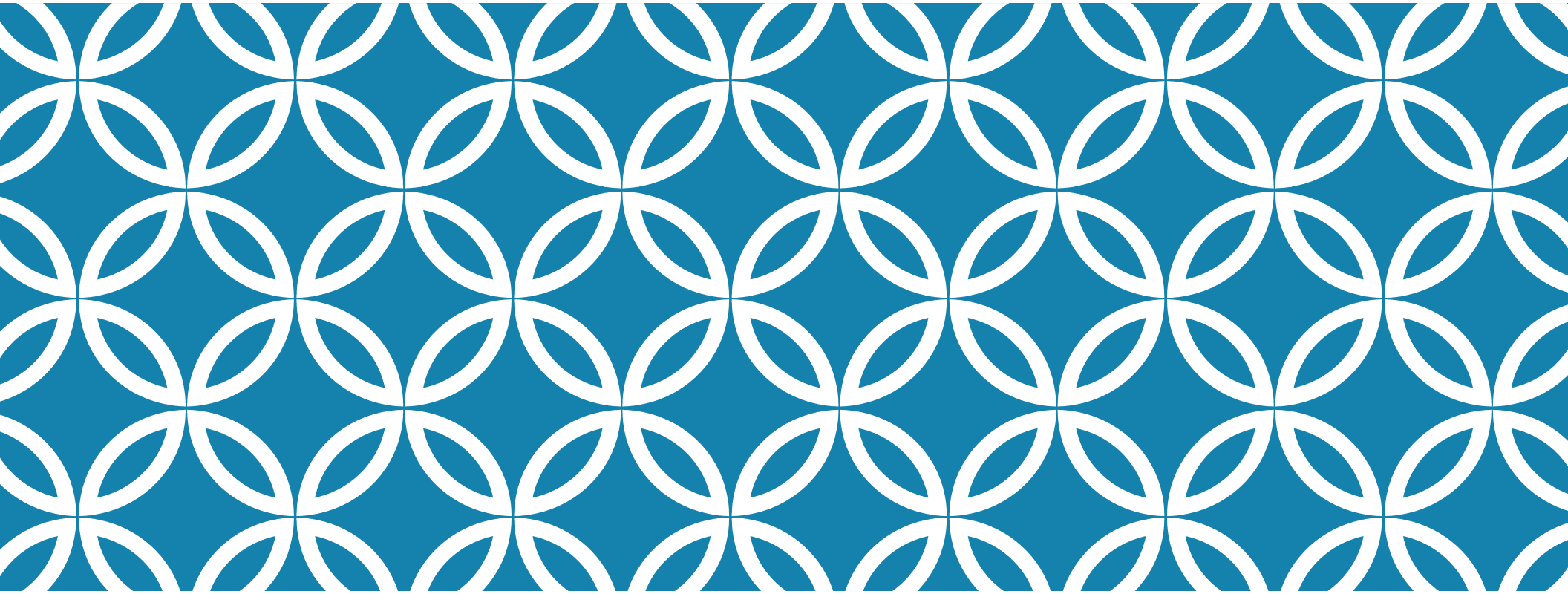


SOLVING SYSTEMS BY GRAPHING PART 2

Cornell Notes

ESSENTIAL QUESTIONS

How can I solve a system of linear equations by graphing?

How to Use Graphs to Solve Linear Systems

Consider the following system:

$x - y = -1$

$x + 2y = 5$

We must ALWAYS verify that your coordinates actually satisfy both equations.

To do this, we substitute the coordinate (1 , 2) into both equations.

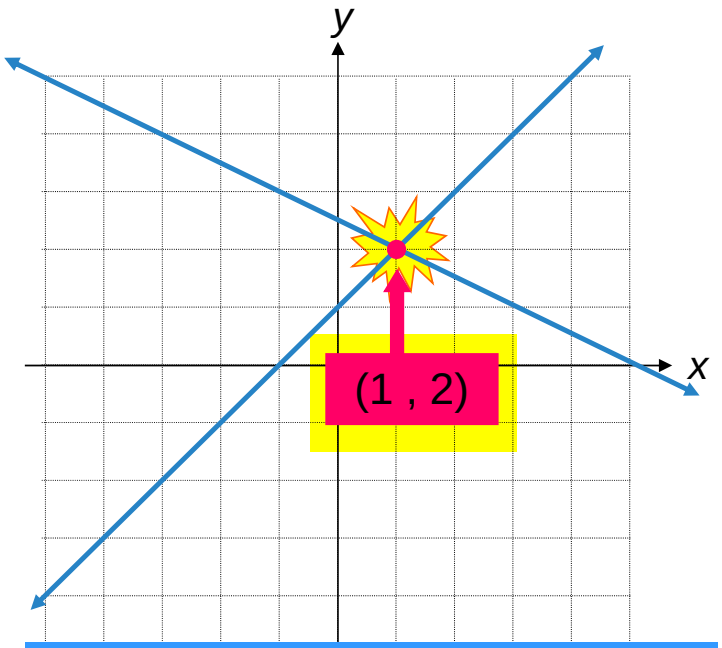
$x - y = -1$

$(1) - (2) = -1$ ✓

$x + 2y = 5$

$(1) + 2(2) =$

$1 + 4 = 5$ ✓



Since (1 , 2) makes both equations true, then (1 , 2) is the solution to the system of linear equations.

SOLVING A SYSTEM OF EQUATIONS BY .

Let's summarize! There are **3 steps** to solving a system using a graph.

Step 1: Graph both equations.

Graph using slope and *y* – intercept or x- and y-intercepts. Be sure to use a ruler and graph paper!

Step 2: Do the graphs intersect?

This is the solution! LABEL the solution!

Step 3: Check your solution.

Substitute the *x* and *y* values into both equations to verify the point is a solution to both equations.

1) FIND THE SOLUTION TO THE FOLLOWING SYSTEM:

$$2x + y = 4$$

$$x - y = 2$$

Graph both equations. I will graph using x- and y-intercepts (plug in zeros).

$2x + y = 4$

(0, 4) and (2, 0)

Graph the ordered pairs.

$x - y = 2$

(0, -2) and (2, 0)

GRAPH THE EQUATIONS.

$2x + y = 4$

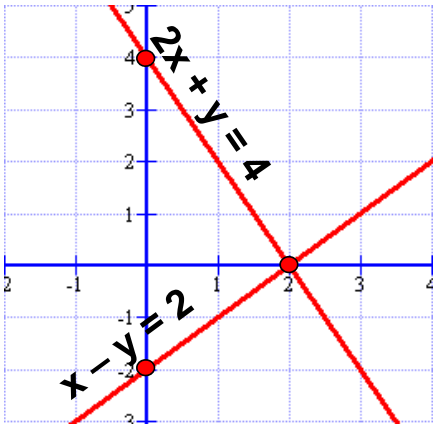
(0, 4) and (2, 0)

$x - y = 2$

(0, -2) and (2, 0)

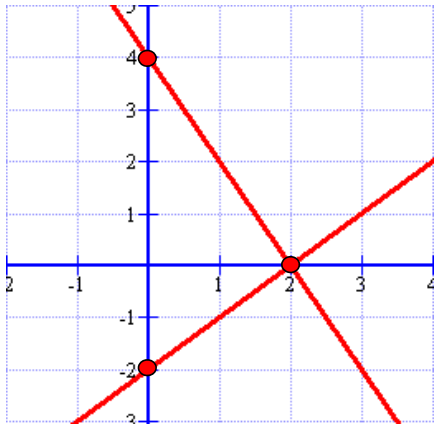
Where do the lines intersect?

(2, 0)



CHECK YOUR ANSWER!

To check your answer, plug the point back into both equations.



$2x + y = 4$

$2(2) + (0) = 4$ ✓

$x - y = 2$

$(2) - (0) = 2$ ✓

Nice job…let's try another!

2) FIND THE SOLUTION TO THE FOLLOWING SYSTEM:

$$y = 2x - 3$$

$$-2x + y = 1$$

Graph both equations. Put both equations in slope-intercept or standard form. I'll do slope-intercept form on this one!

$$y = 2x - 3$$

$$\mathbf{y = 2x + 1}$$

Graph using slope and y-intercept

GRAPH THE EQUATIONS.

$y = 2x - 3$

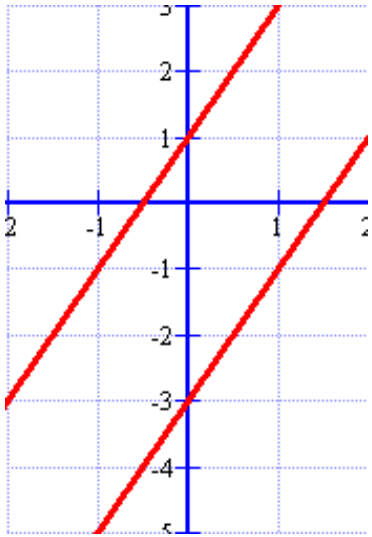
$m = 2$ and $b = -3$

$y = 2x + 1$

$m = 2$ and $b = 1$

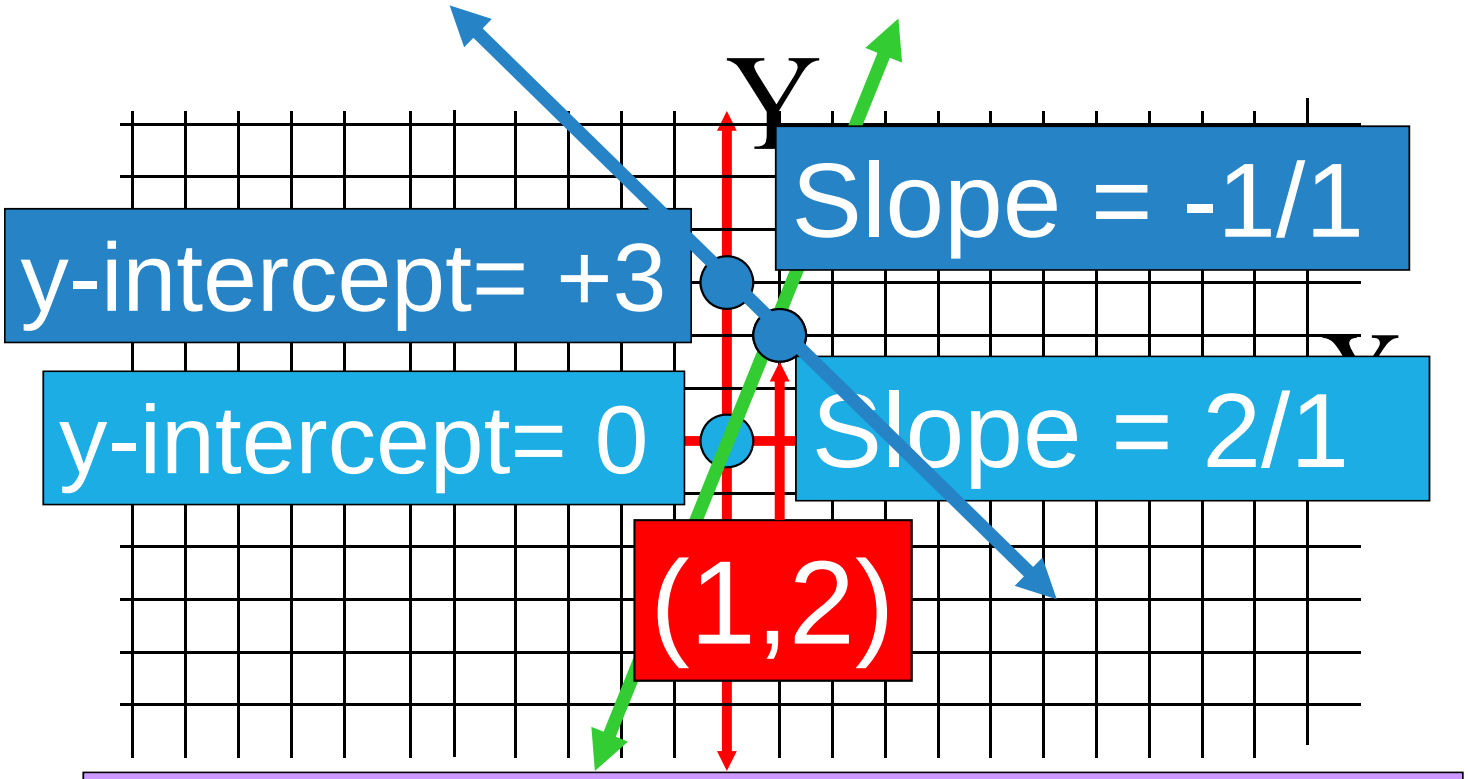
Where do the lines intersect?

No solution!



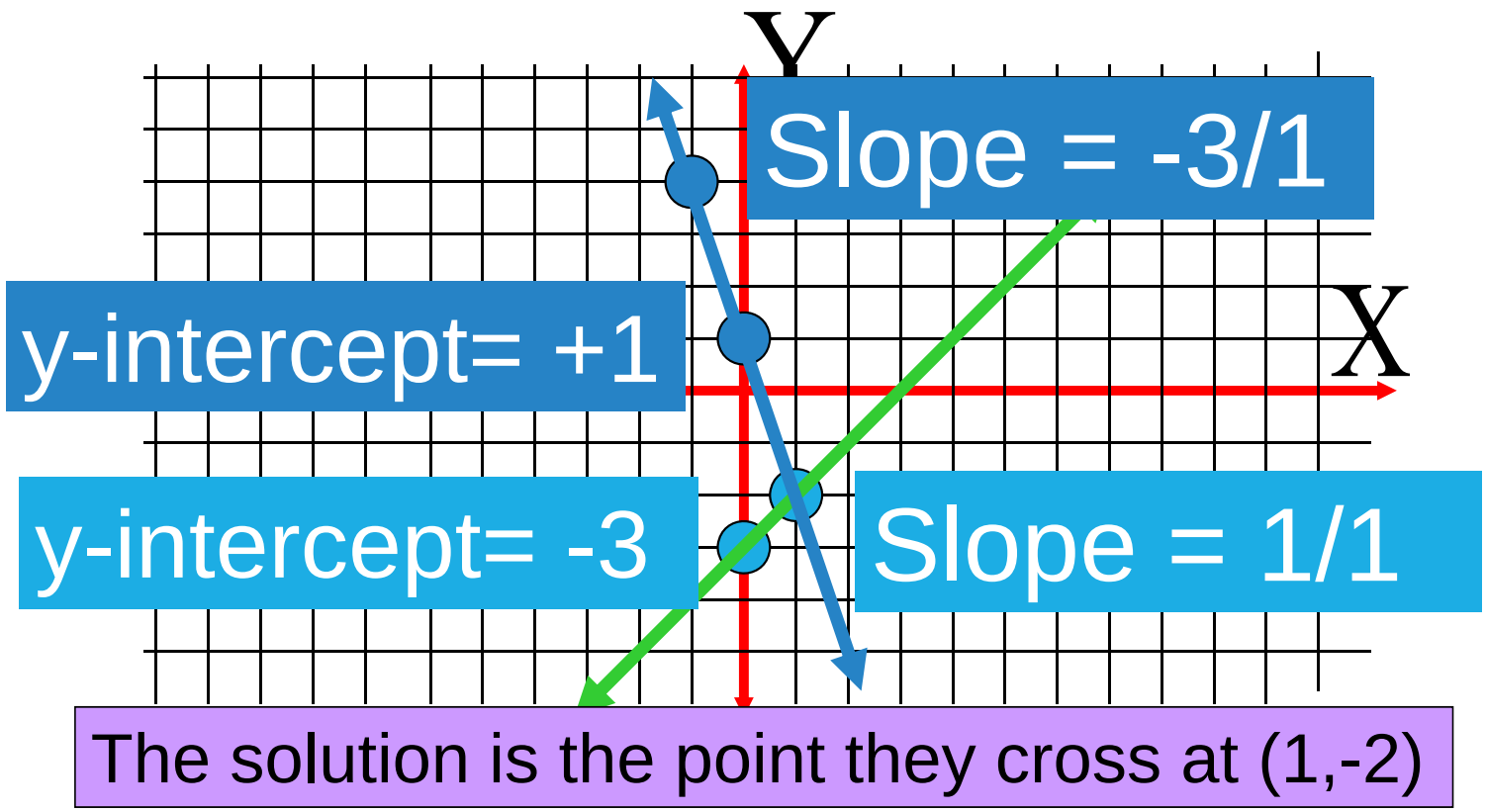
Notice that the slopes are the same with different y-intercepts. If you recognize this early, you don't have to graph them!

Y = 2X + 0 & Y = -1X + 3

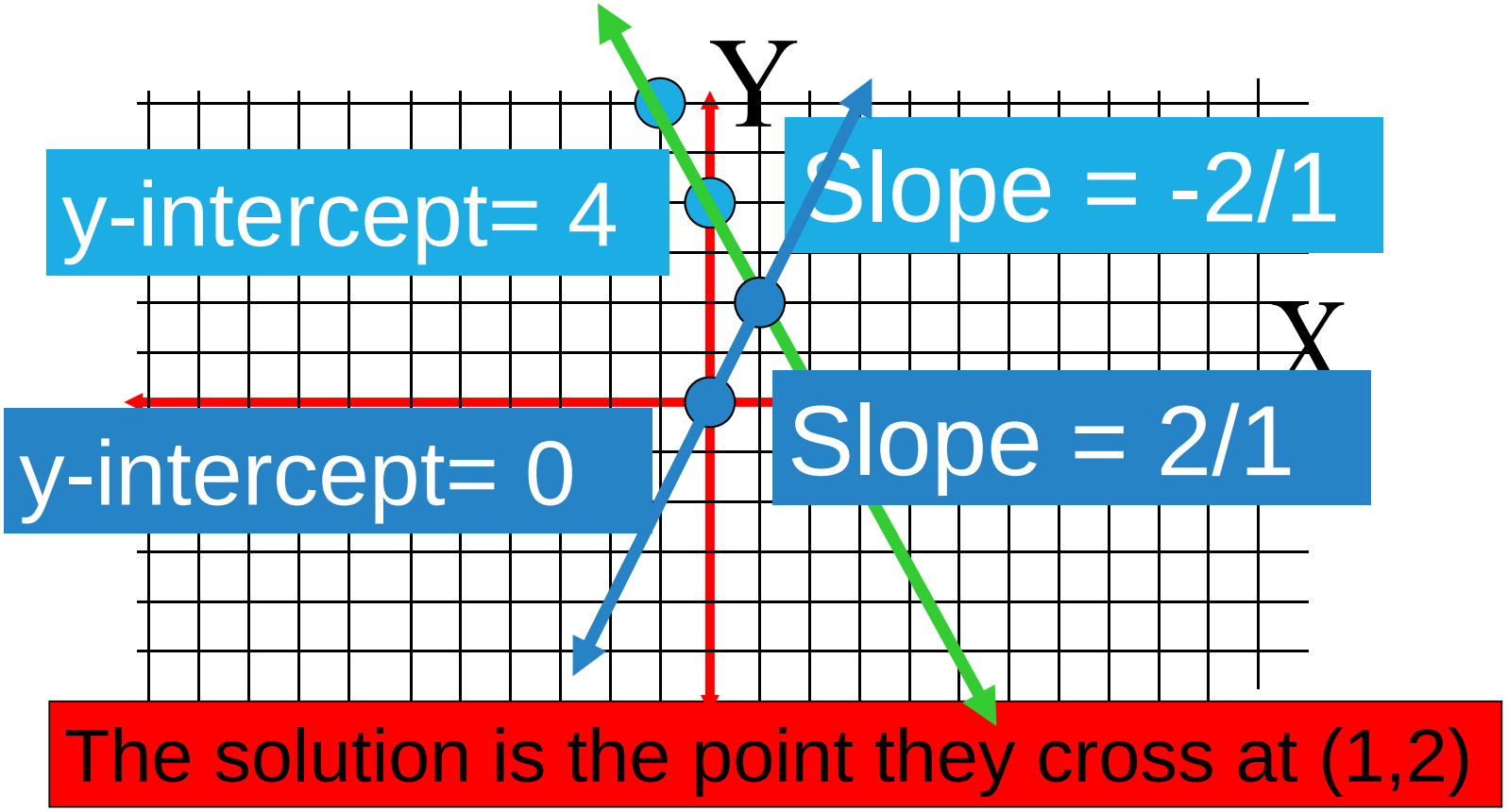


The solution is the point they cross at (1,2)

$Y = X - 3$ & $Y = -3X + 1$


Y
X
Slope = -3/1
y-intercept= +1
y-intercept= -3
Slope = 1/1
The solution is the point they cross at (1,-2)

$Y = -2X + 4$ & $Y = 2X + 0$


Y
X
y-intercept= 4
Slope = -2/1
y-intercept= 0
Slope = 2/1
The solution is the point they cross at (1,2)

Graphing to Solve a Linear System

Solve the following system by graphing:

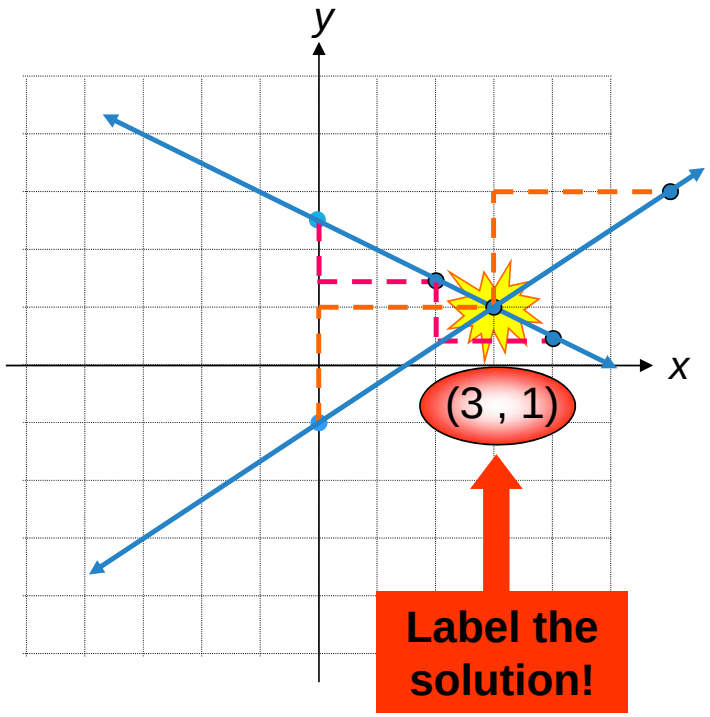
$$3x + 6y = 15$$

$$-2x + 3y = -3$$

Using the slope intercept form of these equations, we can graph them carefully on graph paper.

$$y = -\frac{1}{2}x + \frac{5}{2}$$

$$y = \frac{2}{3}x - 1$$



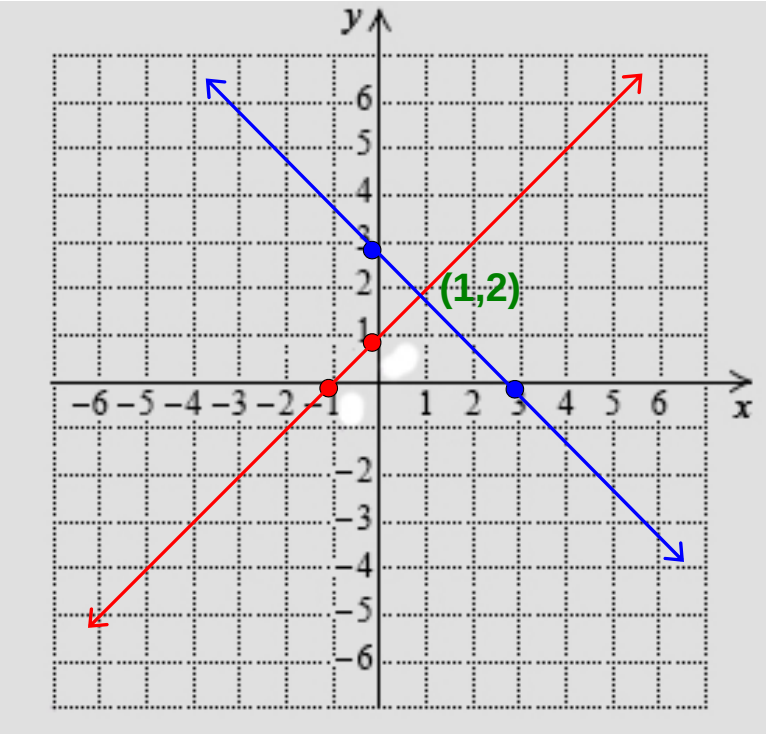
Start at the *y* - intercept, then use the slope.

Lastly, we need to verify our solution is correct, by substituting (3 , 1).

Since $3(3) + 6(1) = 15$ and $-2(3) + 3(1) = -3$, then our solution is correct!

PRACTICE – SOLVING BY GRAPHING

a) $\begin{cases} y - x = 1, \\ y + x = 3 \end{cases}$



y – x = 1 → (0,1) and (-1,0)

y + x = 3 → (0,3) and (3,0)

Solution is probably (1,2) …

Check it:

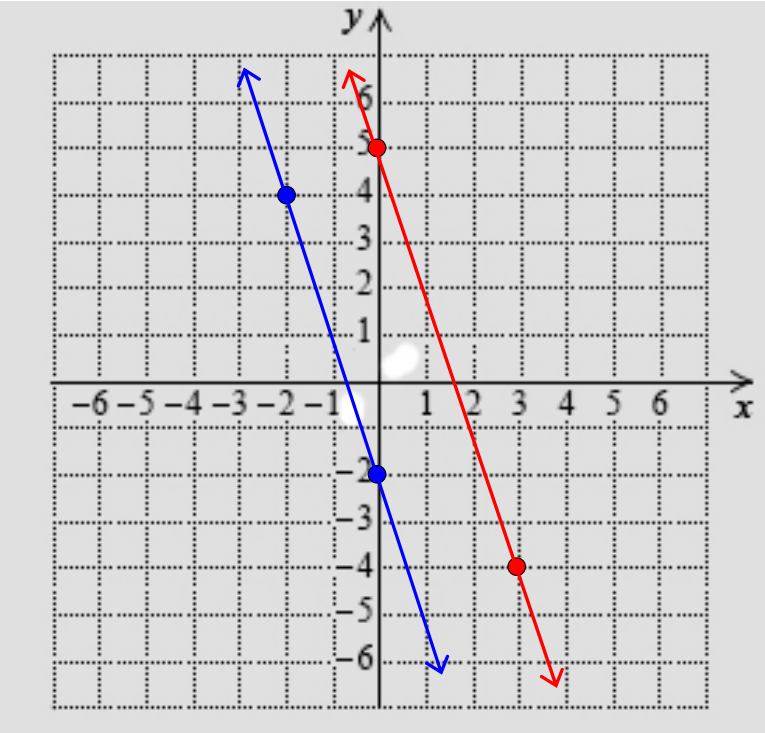
2 – 1 = 1 true

2 + 1 = 3 true

therefore, (1,2) is the solution

PRACTICE – SOLVING BY GRAPHING

b) $\begin{cases} y = -3x + 5, \\ y = -3x - 2 \end{cases}$



Inconsistent: no solutions

y = -3x + 5 → (0,5) and (3,-4)

y = -3x – 2 → (0,-2) and (-2,4)

They look parallel: No solution

Check it:

$m_1 = m_2 = -3$

Slopes are equal therefore it's an inconsistent system

EX: CHECK WHETHER THE ORDERED PAIRS ARE SOLUTIONS OF THE SYSTEM.

$$X-3Y=-5$$
$$-2X+3Y=10$$

A. (1,4)

$1-3(4)=-5$

$1-12=-5$

$-11=-5$

*doesn't work in the 1st equation.

Not a solution.

B. (-5,0)

$-5-3(0)=-5$

$-5=-5$ ✓

$-2(-5)+3(0)=10$

$10=10$ ✓

Solution

EX: SOLVE THE SYSTEM GRAPHICALLY.

$2X+4Y=12$

$X+2Y=6$

1st equation:

x-intercept (6,0)

y-intercept (0,3)

2ND equationn:

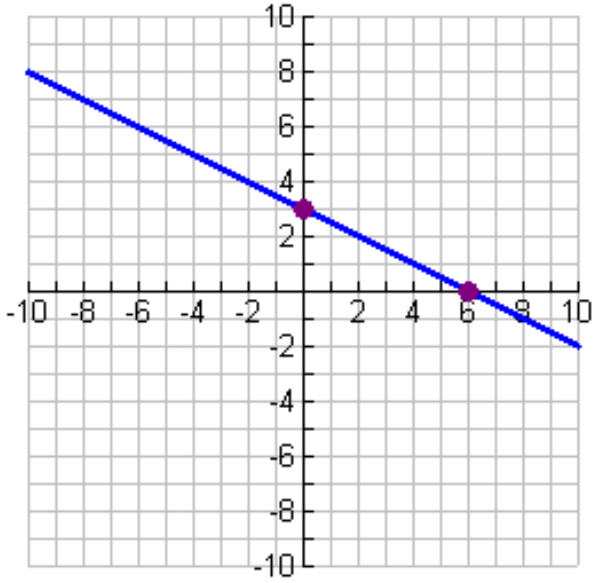
x-intercept (6,0)

y-intercept (0,3)

What does this mean?

the 2 equations are for the same line!

many solutions



EX: SOLVE GRAPHICALLY: X-Y=5
2X-2Y=9

1st equation:

x-intercept (5,0)

y-intercept (0,-5)

2nd equation :

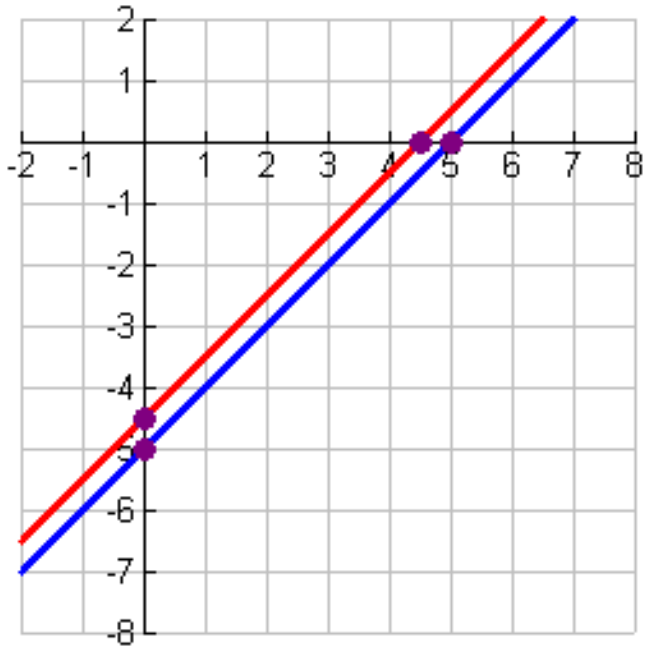
x-intercept (9/2,0)

y-intercept (0,-9/2)

What do you notice about the lines?

They are parallel! Go ahead, check the slopes!

No solution!



WHAT IS THE SOLUTION OF THIS SYSTEM?

$$3x - y = 8$$
$$2y = 6x - 16$$

1. (3, 1)
2. (4, 4)
3. No solution
4. Infinitely many solutions

You Try It

Graph the system of equations. Determine whether the system has one solution, no solution, or infinitely many solutions. If the system has one solution, determine the solution.

1. $x + 3y = 3$

   $3x + 9y = 9$

2. $y = \frac{3}{5}x - 4$

   $5y = 3x$

3. $x + y = 3$

   $2x - y = 6$

CHECK WHETHER THE ORDERED PAIR IS A SOLUTION OF THE SYSTEM:

1.) $3x + 2y = 4$ (2, -1)
$-x + 3y = -5$

2.) $2x + y = 3$ (1, 1) or (0, 3)
$x - 2y = -1$

3.) $x - y = 3$ (-5, -2) or (4, 1)
$3x - y = 11$