

Chapter 7

Section 7.1 - Solving Systems by Graphing

Do you remember what linear equations are? In this chapter we will be looking at linear equations of two variables, but instead of looking only at a single equation, we will look at TWO at the same time. We called them linear systems.

Definition

- ♦ A **linear system** is two or more LINEAR equations in two variables.

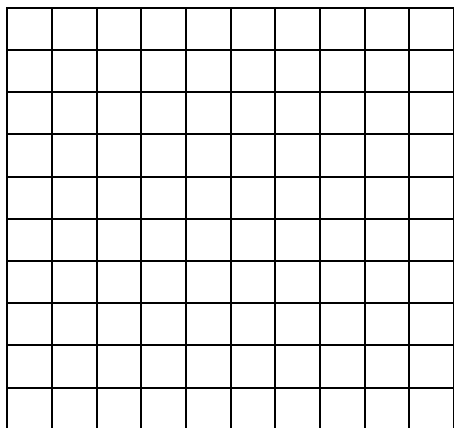
An example is

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

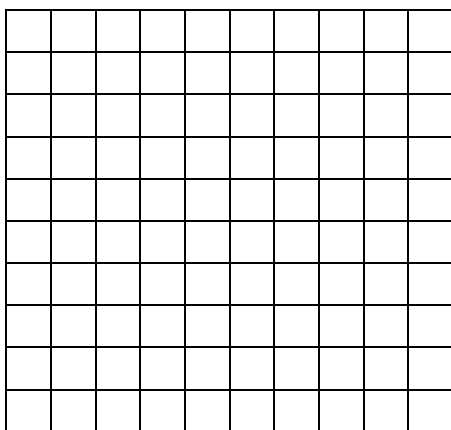
$$x + 3y = -3$$

Just like we learned how to solve a single linear equation, we will learn now how to solve linear systems. So to begin, let's review a couple of things

- a) The linear equation $2x - 3y = -6$ has _____ solutions. Find 3 solutions and GRAPH



- b) The linear equation $x + 3y = -3$ has _____ solutions. Find 3 solutions and GRAPH



c) By looking at your graphs or the tables on parts a) and b), do you think that the equation $2x - 3y = -6$ and $x + 3y = -3$ have a **COMMON** solution? If so what is it and how do you know?

d) Is $(-3, 0)$ a solution to BOTH equations? CHECK!!

Example 1

Determine whether each ordered pair is a solution of the system of the equations.

$$3x - y = -2$$

$$x - 3y = 2$$

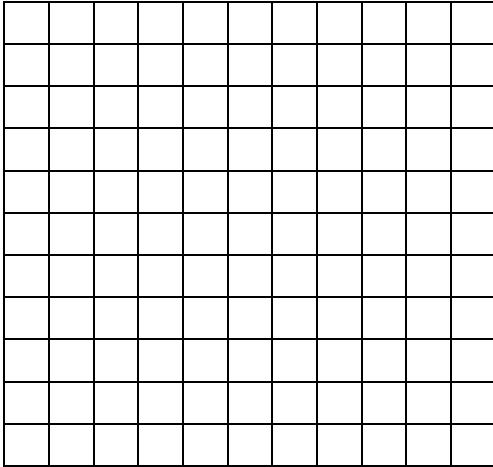
a) $(5, -3)$	b) $(-1, 2)$
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e) Let's go back to the linear system we started working with

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

$$x + 3y = -3$$

Since this is ONE linear system, GRAPH both equations on the same grid.



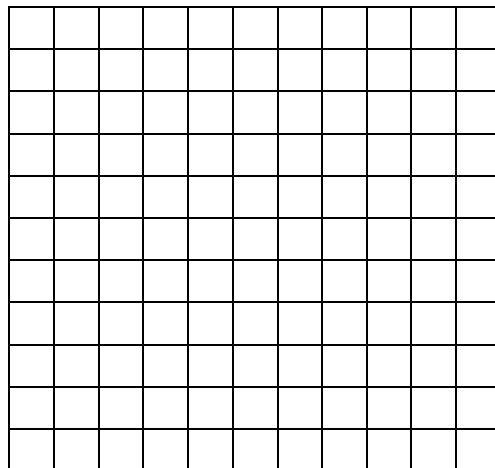
f) Do the lines INTERSECT? At what point do they intersect?

Example #2

$$y = x + 1$$

$$y = -x + 3$$

- a) Graph the linear system
- b) Do the lines intersect? _____
- c) At what point do they intersect? _____
- d) Is the point of intersection a solution of the linear system? SHOW YOUR WORK



Continued Definitions...

By looking at the GRAPH of a linear system, we know it has a **SOLUTION** when...

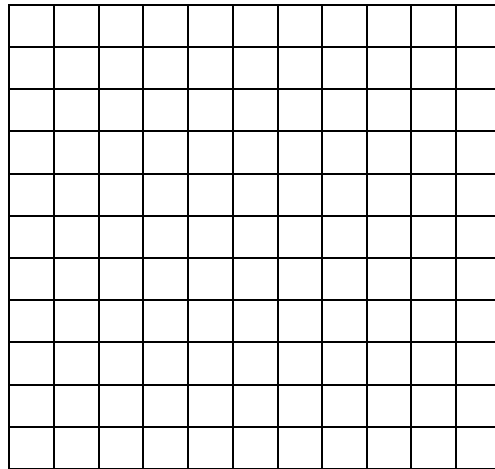
(So ... in other words, we can solve a linear system by GRAPHING and looking for the Point of Intersections)

Example 3

Solve the linear system by graphing.

$$y = 2x - 4$$

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

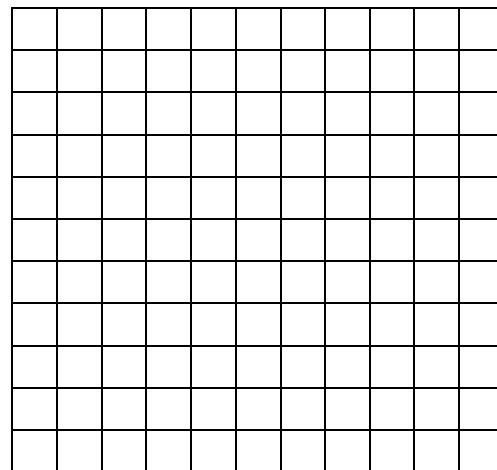


Example 4

Solve the linear system by graphing.

$$\frac{1}{2}x + 2y = -4$$

$$-3x + y = 11$$

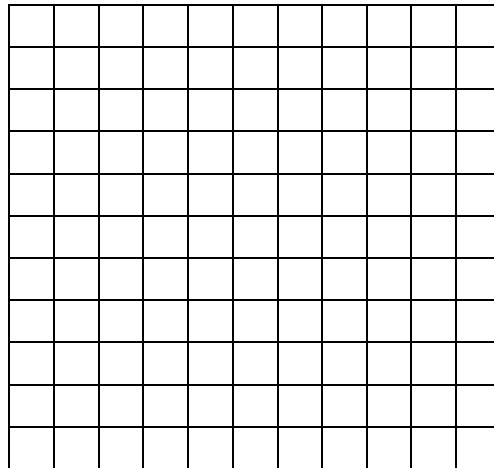


Example 5

Solve the linear system

$$y = 2x - 3$$

$$y = 2x + 1$$



- a) Did the lines intersect?

- b) Do you think this system has a solution? Why or Why NOT?

- c) What kind of lines do we have? (Intersecting lines, parallel lines, same line, or neither)

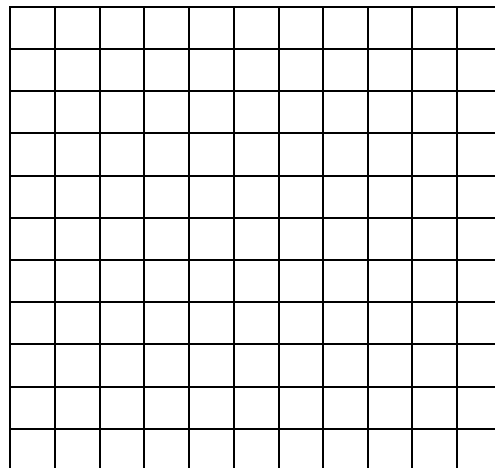
By looking at the GRAPH of a linear system, we know it has a **NO SOLUTION** when...

Example 7

Solve the linear system by graphing.

$$4x - 3y = 3$$

$$4x - 3y = 0$$

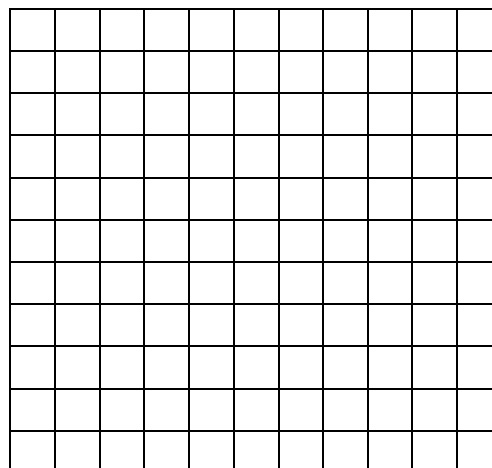


Example 8

Solve the linear system by graphing.

$$x + 7y = -5$$

$$3x - 2y = 8$$

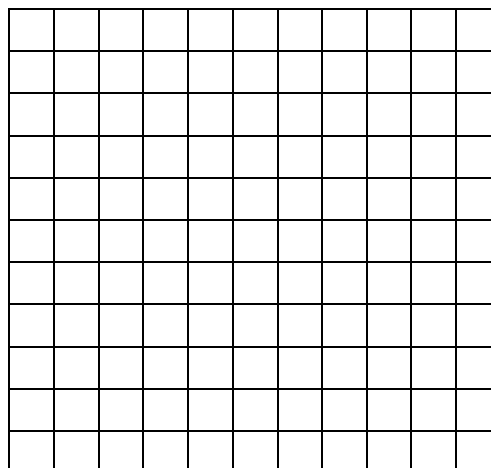


Example 9

Solve the linear system by graphing.

$$x - 2y = 4$$

$$2x - 4y = 8$$



Section 7.2 - Solving Systems of Equations by Substitution

We don't want to graph lines ALL the time to solve linear systems, so by using the **substitution method** we will solve linear systems without graphing each equation.

Solve the linear system

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

$$x + 3y = -3$$

STEPS for the SUBSTITUTION METHOD

1. Rewrite both equations in SLOPE INTERCEPT form
2. Set Equations equal to each other. (YOU SHOULD HAVE NO y variables and only ONE equation)
3. Solve for x
4. Substitute the value you found for x into one of the ORIGINAL equations. It doesn't matter which one you pick....!!!
5. Simplify, and you should have the y value.
6. Final answer should be in ordered pair notation.

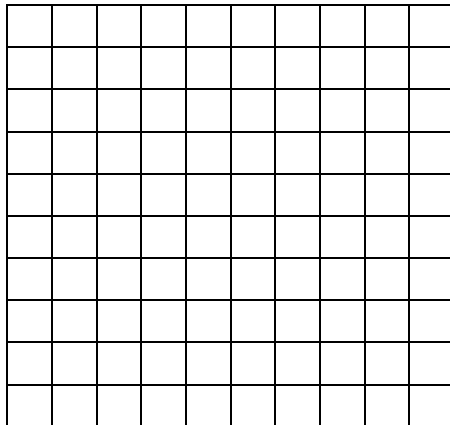
Example 1

a. Solve the linear system using the substitution method.

$$y = 2x - 1$$

$$y = -x + 5$$

b. CHECK your SOLUTION by GRAPHING? (You may use your graphing calculator ...)



c. Do the lines intersect at the solution you found on part a) ?

Example #2

Solve the linear system by using the substitution Method.

$$x - 2y = -10$$

$$3x - y = 0$$

Example #3

Solve the linear system by using the substitution Method.

$$8x + 4y = -2$$

$$-12x + 5y = -8$$

Example #4

Solve the linear system by using the substitution Method.

$$-5x + 4y = 14$$

$$5x - 4y = 4$$

Example #5

Solve the linear system by using the substitution Method.

$$3x - 2y = 3$$

$$-6x + 4y = -6$$

Example #6

Solve the linear system by using the substitution Method.

a) $2x - y = 0$
 $3y = 6$

b) $-3x + 6y = 4$
 $2x + y = 4$

c) $\frac{x}{3} - \frac{y}{4} = 2$
 $\frac{x}{2} + \frac{y}{6} = 3$

Section 7.3 - ELIMINATION METHOD

Solve the following linear system by using the elimination method.

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

$$x + 3y = -3$$

STEPS for the ELIMINATION METHOD

1. Line up your variables and constants
2. Pick a variable to ELIMINATE
3. Multiply the **TOP** or **BOTTOM** or **BOTH** equations by a constant to make **OPPOSITES**
4. Combine your equations together. (You should have **ONE** equation and **ONE** variable)
5. Solve for the remaining variable
6. Go back to **ONE** of the original equations and substitute the value you found on **STEP 5**
7. Final answer should be in ordered pair notation.

Example

Solve the system by elimination

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

$$x + 3y = -3$$

Example 1

Solve the following linear systems using the elimination method.

a) $4a + 5b = 9$
 $2a + 5b = 7$

b) $5x + 3y = 18$
 $2x - 7y = -1$

Example 2

Solve the linear systems using either method. (substitution, elimination, or graphing).

Please state the method you are using.

a) $2x - 4y = 1$
 $5x - 10y = -3$

b) $7x + 10y = 0$
 $21x + 30y = 0$

c) $7x + 8y = 6$
 $3x - 4y = 10$

d) Find all SOLUTIONS!!
Find the linear system

