

Name: _____

Block: _____

Unit 3: Systems of Equations and Inequalities

In this unit, you will learn how to do the following:

Learning Target #1: Graphing Systems of Equations and Inequalities

- Identify the solution to a system from a graph or table
- Graph systems of equations
- Graph systems of inequalities
- Determine solutions to a system of equations or inequalities
- Use a graphing calculator to solve a system of equations

Learning Target #2: Solving Systems of Equations Algebraically

- Use substitution to solve a system of equations
- Use elimination to solve a system of equations
- Determine the best method for solving a systems of equations

Learning Target #3: Applications of Systems

- Write, solve, and interpret systems of equations for problem situations

<u>Mon, 2/3</u> Day 1: Graphing Systems of Equations	<u>Tue, 2/4</u> Day 2: Graphing Systems of Inequalities	<u>Wed, 2/5</u> Day 3: Solving Systems by Substitution	<u>Thurs, 2/6</u> Day 4: Solving Systems by Elimination Quiz	<u>Fri, 2/7</u> Day 5: Applications with Systems
<u>Mon, 2/10</u> Review	<u>Tues, 2/11</u> Unit 3 Test	<u>Wed, 2/12</u> Day 1: Simplifying and Multiplying Radicals	<u>Thurs, 2/13</u> Day 2: Adding/Subtracting Radicals	<u>Thurs, 2/14</u> Day 3: Irrational/Rational Numbers

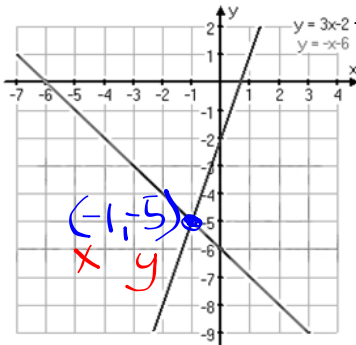
Tutoring Times

	Monday	Tuesday	Wednesday	Thursday	Friday
AM	Mrs. Jackson 7:45 - 8:15 Room 1210	Mr. Phillips 7:45 - 8:15 Room 1206	Mrs. Jackson & Mr. Webb 7:45 - 8:15 Room 1210 Room 1205	Mr. Watson & Mr. Phillips 7:45 - 8:15 Room 1208 Room 1206	Mr. Watson 7:45 - 8:15 Room 1208
PM	NONE	Mrs. Peterson 3:30 - 4:30 Room 1210	NONE	NONE	NONE

Day 1 – Graphing Systems of Equations

Two or more linear equations in the same variable form a **system of equations**. A **solution** to a system is a pair of numbers a and b for which $x = a$ and $y = b$ to make each equation a true statement. A solution is also the point where the two equations intersect each other on a graph.

Example: Find the solution of the linear equation and check your answer.



$$y = 3x - 2$$

$$-5 = 3(-1) - 2$$

$$-5 = -3 - 2$$

$$-5 = -5 \checkmark$$

$$y = -x - 6$$

$$-5 = -(-1) - 6$$

$$-5 = +1 - 6$$

$$-5 = -5 \checkmark$$

Examples: Check whether the ordered pair is a solution of the system of linear equations.

Ex. $(1, 1)$ yes

$$2x + y = 3$$

$$x - 2y = -1$$

$$2(1) + (1) = 3$$

$$2 + 1 = 3$$

$$3 = 3 \checkmark$$

$$x - 2y = -1$$

$$1 - 2(1) = -1$$

$$1 - 2 = -1$$

$$-1 = -1 \checkmark$$

Ex. $(-2, 4)$ no

$$4x + y = -4$$

$$-x - y = 1$$

$$4(-2) + 4 = -4$$

$$-8 + 4 = -4$$

$$-4 = -4 \checkmark$$

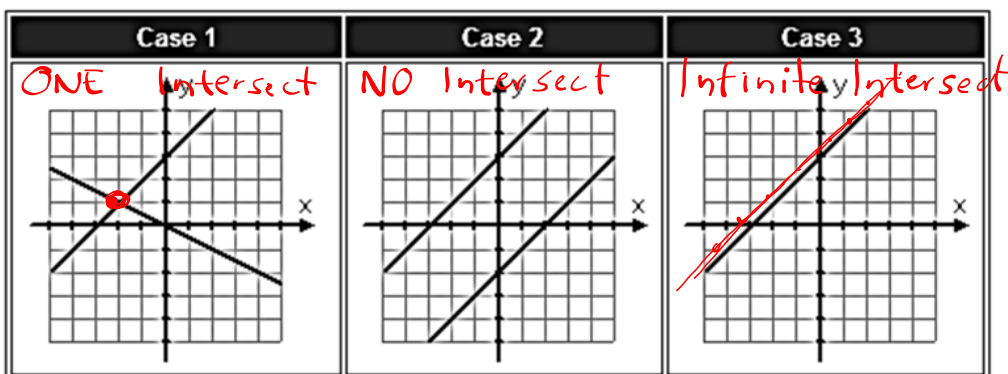
$$-x - y = 1$$

$$-(-2) - 4 = 1$$

$$2 - 4 = 1$$

$$-2 \neq 1$$

A system of equations can have three different types of solutions: **no solution**, **one solution**, or **infinite solutions**. Look at the graph below to determine how these solutions look on a graph.



One Solution
Intersecting Lines
Consistent/Independent

No Solution
Parallel Lines
Inconsistent

Infinite Solutions
One line
Consistent/Dependent

Algebra 1

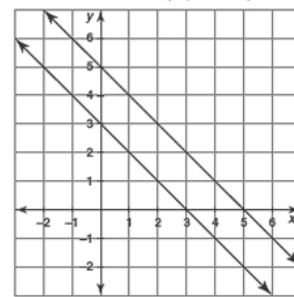
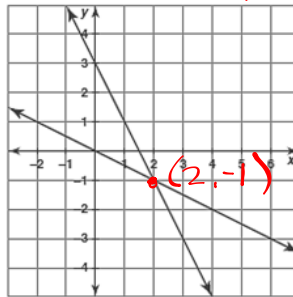
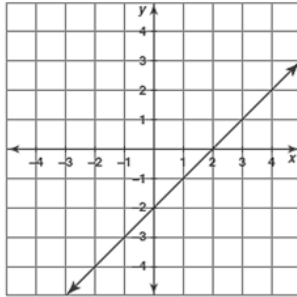
Unit 3: Systems of Equations & Inequalities

Notes

Practice: Tell how many solutions the systems of equations has. If it has one solution, name the solution.

Infinite Solution ONE : (2, -1)

No Solution



Identify Solutions to a System from a Table

Remember, that the solution to a system of equations is where the two lines intersect each other. The point of the intersection is the **solution**. Using the tables below, identify the solution.

a. (3, -3)

x	$y = -x$	$y = x - 6$
0	0	-6
3	-3	-3
6	-6	0
9	-9	3

b. (1, 6)

x	$y = 2x + 4$	$y = 4x + 2$
-2	0	-6
-1	2	-2
0	4	2
1	6	6

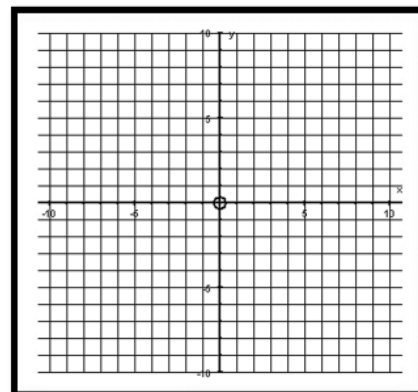
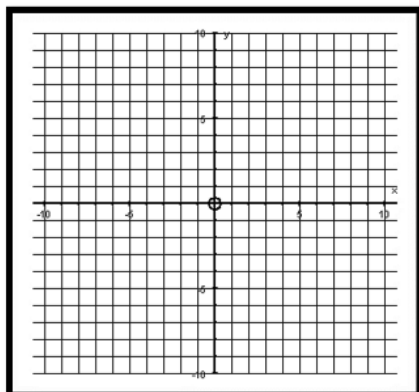
Solving a Linear System by Graphing

- Step 1: Write each equation in slope intercept form ($y = mx + b$).
- Step 2: Graph both equations in the same coordinate plane.
- Step 3: Estimate the coordinates of the point of intersection.
- Step 4: Check whether the coordinates give a true solution by substituting them into each equation of the original linear system.

Example: Use the graph and check method to solve the linear equations.

A. $y = x - 2$ $y = -x + 4$

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



Algebra 1

Unit 3: Systems of Equations & Inequalities

Notes

C. $3x + y = 6$ $-x + y = -2$

$$\begin{array}{r} 3x + y = 6 \\ -3x - 3y = -6 \\ \hline y = -3x + 6 \end{array}$$

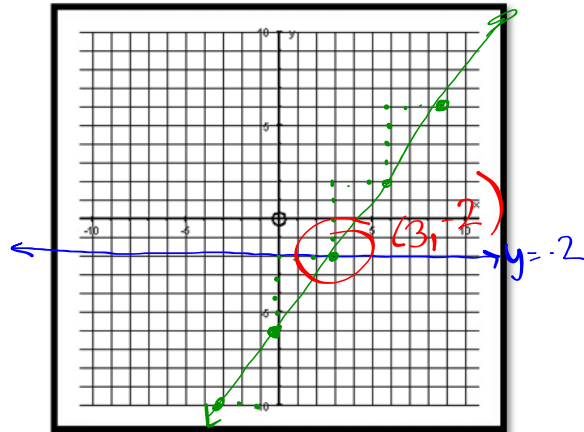
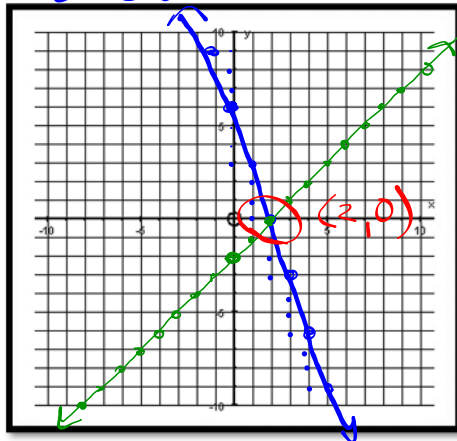
$$\begin{array}{r} -x + y = -2 \\ +x \\ \hline y = x - 2 \end{array}$$

$0 = 3(2) + 6$ $0 = 2 - 2$
 $0 = -6 + 6$ $0 = 0 \checkmark$
 $0 = 0 \checkmark$

D. $y = -2$ *HOY*

$$\begin{array}{r} 4x - 3y = 18 \\ -4x \\ \hline -3y = -4x + 18 \\ \hline y = \frac{4}{3}x - 6 \end{array}$$

$(3, -2)$



Using a Graphing Calculator to Solve a Systems of Equations

Use a graphing calculator to solve the following systems of equations: $y = \frac{2}{3}x$
 $y = -x + 5$

1. Hit **Y =** and enter the first equation into y_1 and the second equation into y_2 (as shown on the right)

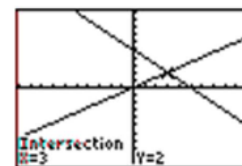


2. Hit **Graph** (Hit **Zoom**, then **6** to get back to a standard viewing window, if necessary).

3. To find the solution, hit **2nd**, followed by **Trace** (you really want the Calc feature), followed by **5: Intersect**

4. The calculator will say:

First Curve: Make sure cursor is on one of the lines, hit **Enter**
Second Curve: Make sure cursor moved to second line, hit **Enter**
Guess: hit **Enter**



5. The point of intersection will be named at the bottom of the screen (as shown to the right).

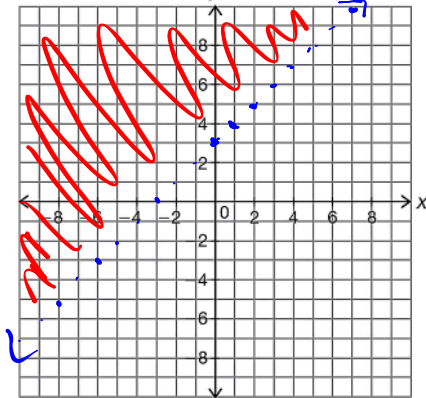
6. You can also use the table on the graphing calculator to find the solution as well by hitting **2nd** followed by **Graph** (you really want the Table feature). Scroll through the table until you find where the y_1 and y_2 values are the same.

Day 2 – Graphing Systems of Inequalities

Review: Graph each inequality. Name a solution that would satisfy the inequality.

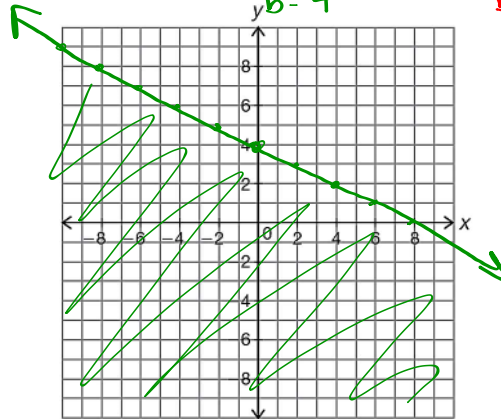
a. $y > x + 3$

$m = 1$ above
 $b = 3$ dashed



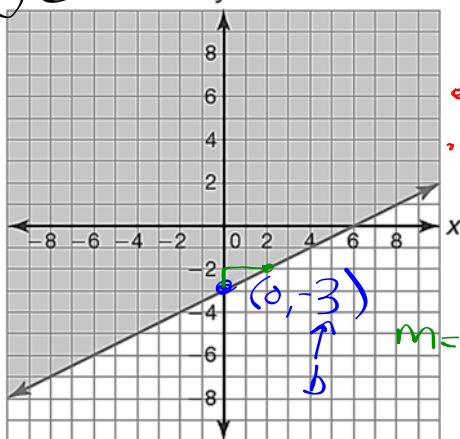
b. $y \leq -\frac{1}{2}x + 4$

$m = -\frac{1}{2}$ Solid
 $b = 4$ below

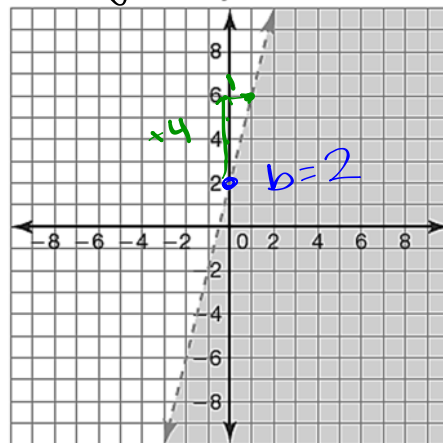


Review: Name the inequality that represents both graphs.

c. $y \geq \frac{1}{2}x - 3$



d. $y < 4x + 2$



The **solution of a system of linear inequalities** is the intersection of the solution to each inequality. Every point in the intersection regions satisfies the solution. Determine if the following points are a solution to the inequality:

$x + 5y < -1$

$2y \geq -3x - 2$

$(0, -1)$ ✓

$x + 5y < -1$

$0 + 5(-1) < -1$

$-5 < -1$ ✓

$2y \geq -3x - 2$

$2(-1) \geq -3(0) - 2$

$-2 \geq -3 - 2$

$-2 \geq -5$ ✓

$(2, 3)$

$x + 5y < -1$

$2 + 5(3) < -1$

$2 + 15 < -1$

$17 < -1$

NO

$2y \geq -3x - 2$

$2(3) \geq -3(2) - 2$

$6 \geq -6 - 2$

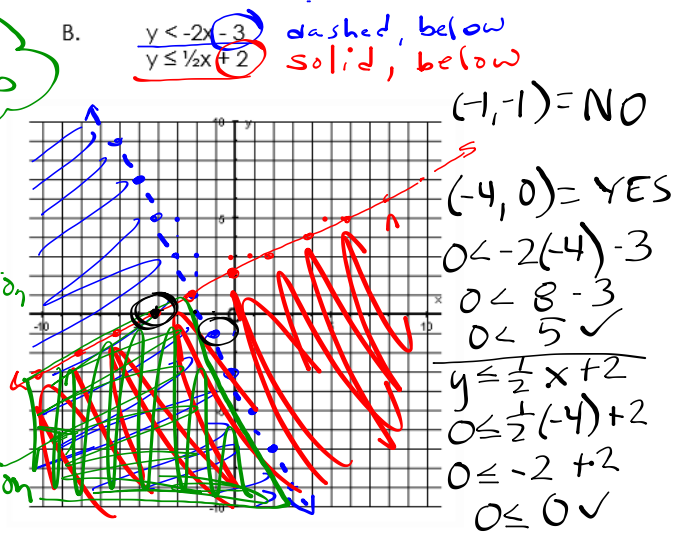
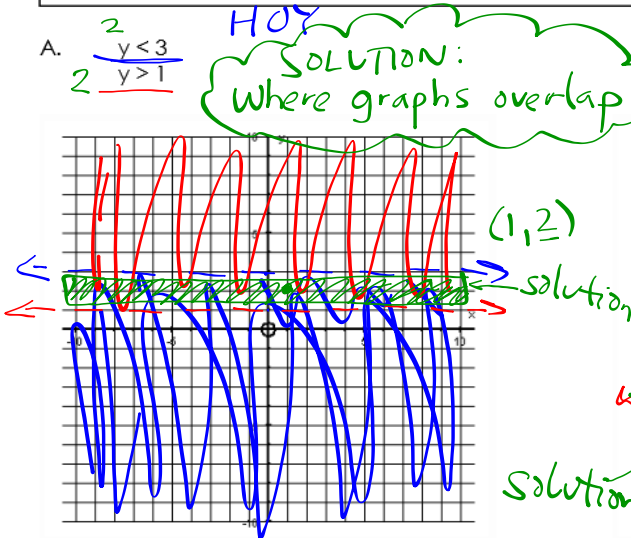
$6 \geq -8$ ✓

Steps for Graphing Systems of Inequalities

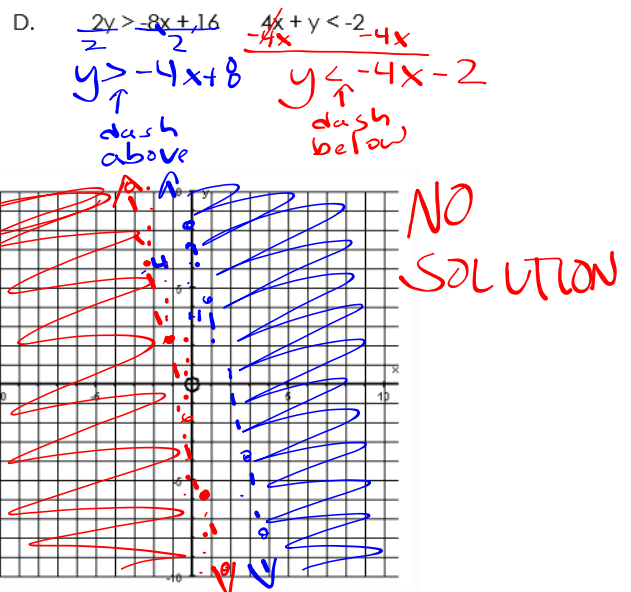
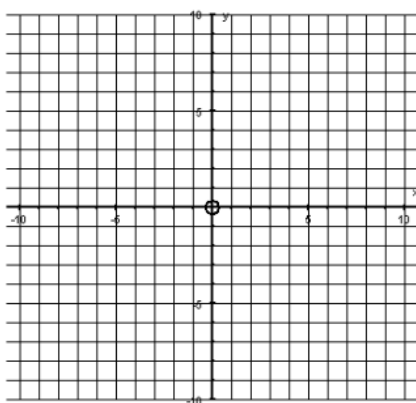
Step 1: Graph the boundary lines of each inequality. Use dashed lines if the inequality is $<$ or $>$. Use a solid line if the inequality is \leq or \geq .

Step 2: Shade the appropriate half plane for each inequality.

Step 3: Identify the solution of the system of inequalities as the intersection of the half planes from Step 2.



C. $y \geq 2/3x + 3$ $y > -4/3x - 3$



Using a Graphing Calculator to Solve a Systems of Inequalities

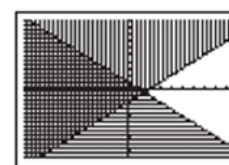
Example: Use your graphing calculator to name three solutions to the system of inequalities: $y \geq -2 + x$
 $y \leq 1 - x$

Step 1: Hit **Y=** and enter your equations into the Y_1 and Y_2 spots.



Step 2: Move the cursor to the left of Y_1 and press **ENTER** until you see the graph style that describes the shading of your inequality symbols ($>/\geq$ will shade above and $</\leq$ will shade below). You have to tell the calculator what direction to shade so it is crucial you understanding how the shading relates to the inequality symbol.

Step 3: Do the same thing for Y_2 .

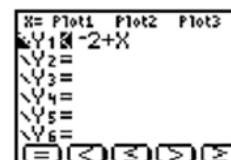
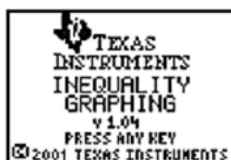


Step 4: Hit **GRAPH**.

Using your graphing calculator is a great way to check to see if you graphed your systems of inequalities correctly.

Note: The calculator will always graph solid lines. You have to use the Inequalz App to if you want the graphing calculator to differentiate between dashed and solid lines.

Using a Graphing Calculator to Solve a Systems of Inequalities using Inequalz App (TI-84 only)



Step 1: Press **APPS** and scroll down to **:Inequalz** and hit **ENTER**.

Step 2: Enter your expressions in for Y_1 and Y_2 and then move over to the equal sign.

Step 3: Press **ALPHA** and then one of the five keys in the top row of your calculator to select the equality or inequality sign you want for both y_1 and y_2 .

Step 4: Press **GRAPH**.

If you only want to see the shaded region, press **ALPHA**, then **F1** to select **Shades**. Select **1:Ineq Intersection**. Only the solution region – the region where all inequalities intersect is shown.

To Quit the InequalZ App:

Press **APPS**, scroll down to **:Inequalz**, press **ENTER**, and select **2:QuitInequal**.