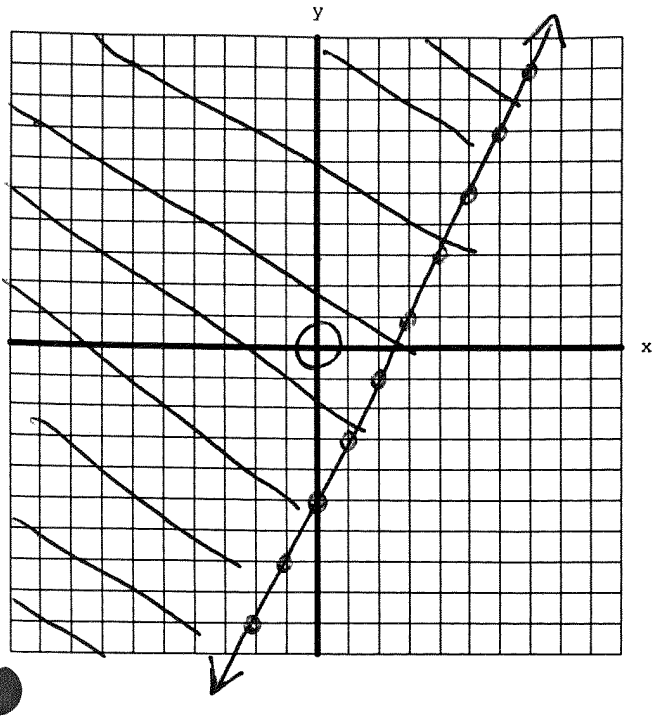
Unit 2 3.1

Graphing a Linear Inequality Notes

Key

Objective: Determine the solution to a system of linear inequalities by graphing.

Graph: $y \geq 2x - 5$



Step 1: Put the equation in slope-intercept form

Step 2: Graph the equation (dashed or solid?)

not solutions

solutions

$>$ or $<$ $\geq$ or $\leq$

Step 3: Figure out where to shade by picking a test point. A common test point to use is (0, 0).

$0 \geq 2(0) - 5$

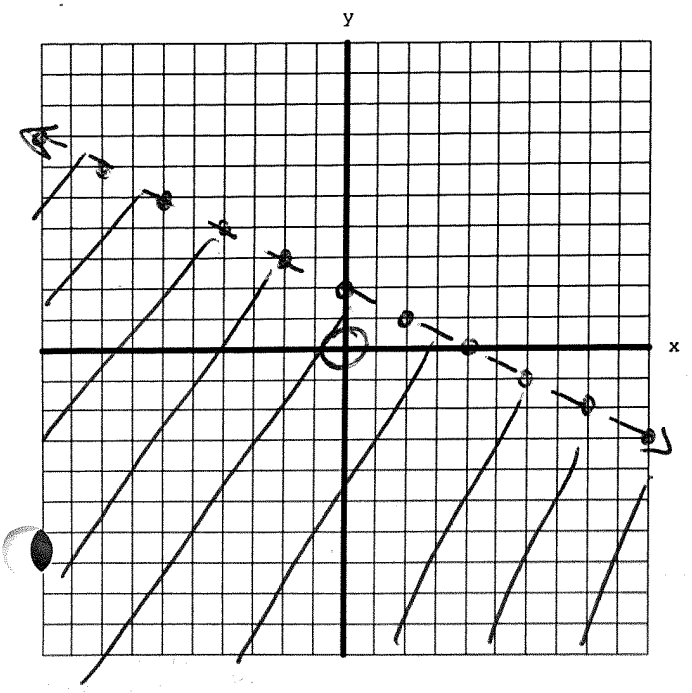
$0 \geq -5$ True

If the test point gives a **true** statement you shade the **half** the test point is in.

If the test point gives a **false** statement you shade the **opposite half** the test point is in.

You try:

Graph: $2x + 4y < 8$



$\frac{4y}{4} < \frac{-2x}{4} + \frac{8}{4}$

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

$2(0) + 4(0) < 8$

$0 < 8$ True

OR

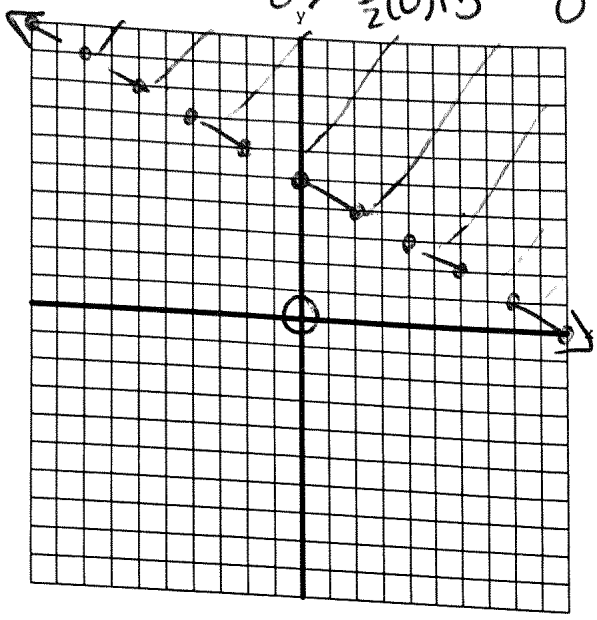
$0 < -\frac{1}{2}(0) + 2$

$0 < 2$ True

Examples:

1. Graph the inequality $y > -\frac{1}{2}x + 5$. What are some solutions to the inequality? (1, 10) (-5, 9) (0, 6)

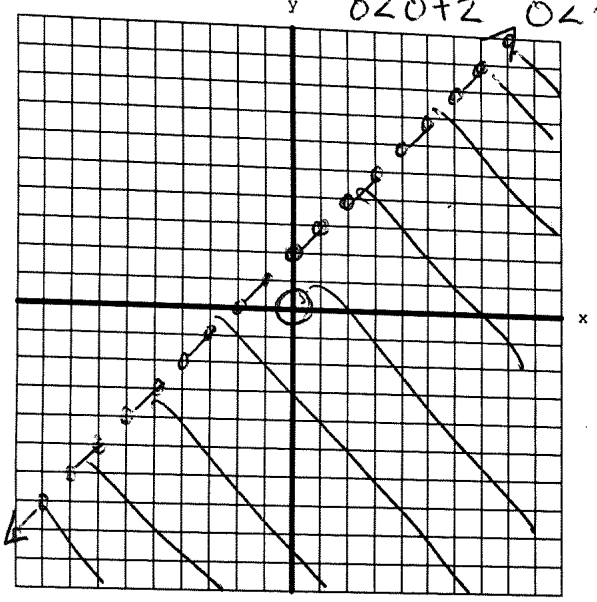
$0 > -\frac{1}{2}(0) + 5$ $0 > 5$ False



answers may vary

2. Graph the inequality $y < x + 2$. What are some solutions to the inequality? (0, 0) (8, 0) (0, -8)

$0 < 0 + 2$ $0 < 2$ True



answers may vary

3. Looking at both graphs:
   a. Are there any solutions that work for both inequalities?
   Give three examples (6, 4) (10, 1) (8, 3)

answers may vary

   b. Are there any solutions that work for 1 inequality but not the other?
   Give three examples (0, 0) (0, 10) (-2, -2) and write the correct inequality below each answer.

#2	#1	#2
not	not	not
#1	#2	#1

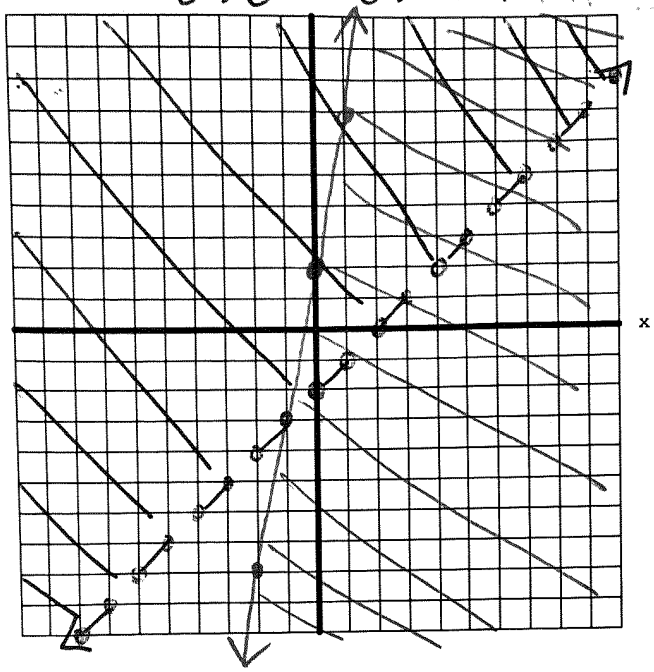
answers may vary

* easier to answer this question if both inequalities were graphed on the same graph

Graphing a System of Inequalities Notes

Graph: $y \leq 5x + 2$ $0 \leq 5(0)+2$ $0 \leq 2$ True

• $y > x - 2$ $0 > 0 - 2$ $0 > -2$ True



Step 1: Put both equations in slope-intercept form

Step 2: Graph each equation (dashed or solid?)

Step 3: Figure out where to shade by picking a test point. A common test point to use is (0, 0).

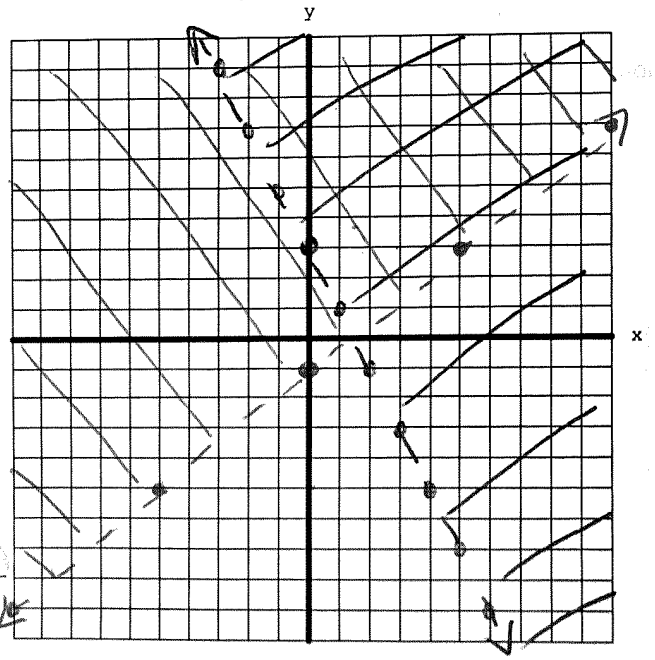
Test point must make **both** equations **true**.

- Method 1: Guess and check each of the four regions
- Method 2: Shade both regions individually and the overlap is your answer

You try:

Graph: $2x + y > 3$

$4x - 5y < 5$



• $y > -2x + 3$

$0 > -2(0) + 3$

$0 > 3$ False

$\frac{-5y}{-5} < \frac{-4x+5}{-5} \frac{}{-5}$ ← flip the sign!

• $y > \frac{4}{5}x - 1$

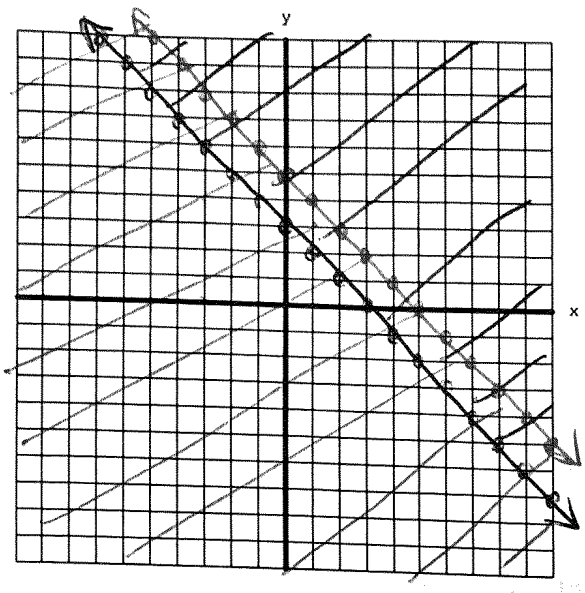
$0 > \frac{4}{5}(0) - 1$

$0 > -1$ True

Examples:

4. Graph the following system of inequalities on the same graph. Use a different color for each

they don't need to do this if drawn with straight lines



$x + y \geq 3$

$y \geq -x+3$

$0+0 \geq 3$

$0 \geq 0$ False

OR

$0 \geq -0+3$

$0 \geq 3$ False

$y \leq -x+5$

$0 \leq -0+5$

$0 \leq 5$ True

a. Give three coordinates that are solutions to the system. (1, 3) (5, -1) (-3, 6) answers may vary

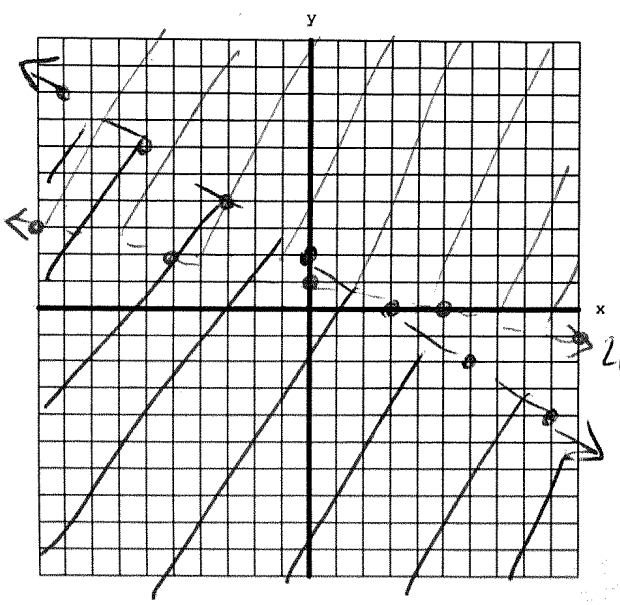
b. Give three coordinates that are not solutions to the system. (0, 0) (-10, 0) (10, 0)

answers may vary

c. Is a coordinate on a line a solution?

yes, creates true statements as long as they are along the shaded region

5. Graph the following on the same graph and give three solutions. (-4, 3) (-9, 5) (-10, 7) answers may vary



$2x + 3y < 6$

$3y < -2x+6$

$y < -\frac{2}{3}x+2$

$2(0)+3(0)<6$

$0<6$ True

OR

$0 < -\frac{2}{3}(0)+2$

$0<2$ True

$x + 5y > 5$

$\frac{5}{5}y > \frac{-x}{5}+\frac{5}{5}$

$y > -\frac{1}{5}x+1$

$0+5(0)>5$

$0>5$

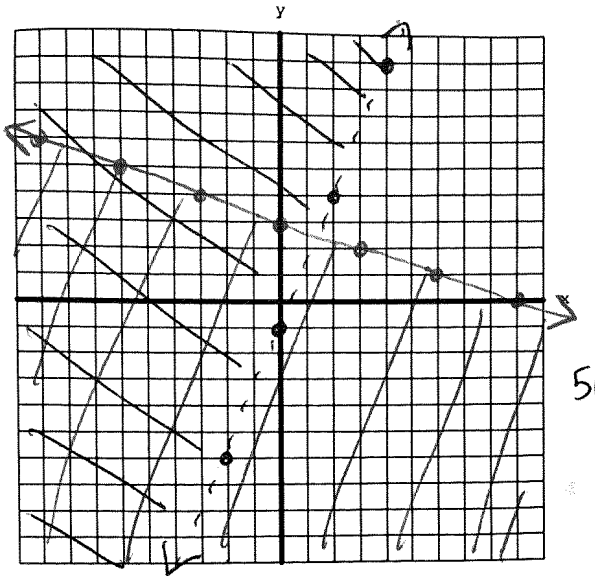
False

OR

$0 > -\frac{1}{5}(0)+1$

$0>1$ False

6. Graph the following on the same graph and give three solutions. (,) (,) (,) anything in double shaded region



$5x - 2y < 2$

$-2y < -5x + 2$

$y > \frac{5}{2}x - 1$

$5(0) - 2(0) < 2$

$0 < 2$ True

OR

$0 > \frac{5}{2}(0) - 1$

$0 > -1$

True

$2x + 6y \leq 18$

$6y \leq -2x + 18$

$y \leq -\frac{1}{3}x + 3$

$2(0) + 6(0) \leq 18$

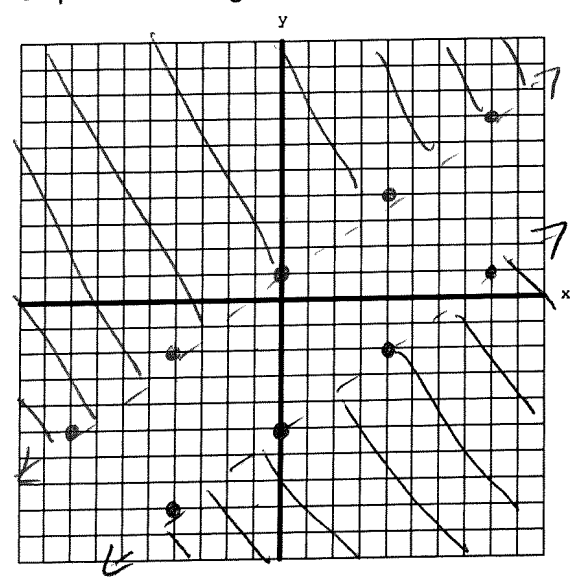
$0 \leq 18$ True

OR

$0 \leq -\frac{1}{3}(0) + 3$

$0 \leq 3$ True

7. Graph the following on the same graph and give three solutions. (,) (,) (,) no sdutians



$3x - 4y > 20$

$-4y > -3x + 20$

$y < \frac{3}{4}x - 5$

$3(0) - 4(0) > 20$

$0 > 20$ False

OR

$0 < \frac{3}{4}(0) - 5$

$0 < -5$ False

$y > \frac{3}{4}x + 1$

$0 > \frac{3}{4}(0) + 1$

$0 > 1$ Fake

Summary of Systems of Linear Inequalities

*The solution to a system of linear equations is the point of intersection.

*The solution to a system of linear inequalities is the region of intersection.

•In order to solve a system of linear *inequalities*, you MUST graph.

Steps for Graphing Linear Inequalities and a System of Linear Inequalities

1.) Solve each inequality for y.
- **DON'T FORGET**: Flip the sign if you multiply or divide by a negative number!

2.) Graph each line.
- $>$ *and* $<$ dashed line
- $\geq$ *and* $\leq$ solid line

3.) Shade each line.
- For $>$ *and* $\geq$ shade above the line
- For $<$ *and* $\leq$ shade below the line

4.) The "solution region" is the area where **all** the shadings overlap.
- Dashed lines are/are not part of the solution.
- Solid lines are/are not part of the solution.

Graph the system of inequalities then determine which of the following orders pairs would be solutions:

$4x + 6y > 36$ 4(0)+6(0)>36 False

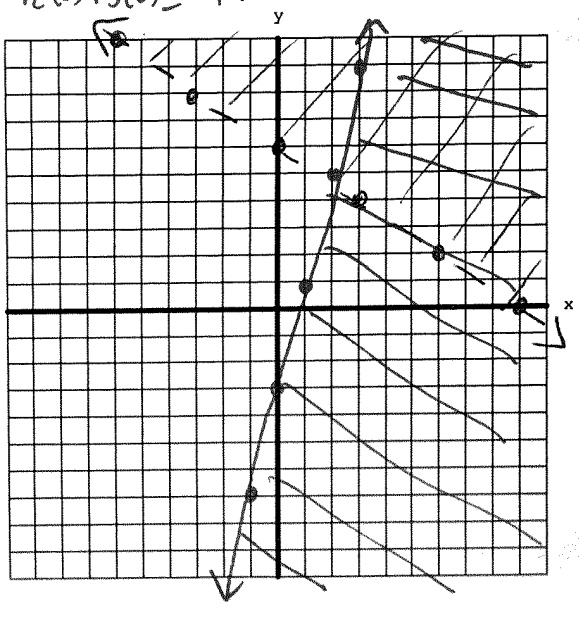
$6y > -4x + 36$

$y > -\frac{2}{3}x + 6$

$-12x + 3y \leq -9$ -12(0)+3(0)≤-9 False

$3y \leq 12x - 9$

$y \leq 4x - 3$



Circle the ordered pairs that are solutions.

Cross off the ordered pairs that are not solution

a. (6,2)
b. (10,5)
c. (−5,10)
d. (0,−3)
e. (−10,5)
f. (5,−10)
g. (2,5)
h. (−9,0)