

Solving Systems of Linear Inequalities

A **system of linear inequalities** is a set of two or more linear inequalities containing two or more variables. The **solutions of a system of linear inequalities** are all the ordered pairs that satisfy all the linear inequalities in the system.

Example 1: Tell whether the ordered pair is a solution of the given systems.

REMEMBER: An ordered pair must be a solution of all inequalities to be a solution of the system.

a.) x y
 $(2, 1);$
 $y < -x + 4$
 $y \leq x + 1$

$1 < -2 + 4$
 $1 < 2 \checkmark$

$1 \leq 2 + 1$
 $1 \leq 3 \checkmark$

yes it is a solution!

b.) x y
 $(2, 0);$
 $y \geq 2x$
 $y < x + 1$

$0 \geq 2(2)$
 $0 \geq 4 \times$

No it is not a solution!

To graph a system of linear inequalities:

- 1.) Graph both linear inequalities on the same coordinate plane and shade the appropriate region.
- 2.) The solutions lie in the overlapping region so be sure to darken where the two regions overlap.

Example 2: Graph each system of linear inequalities. Give two ordered pairs that are solutions.

a.) $x \geq -2$
 $y > 3$

$\checkmark \checkmark$
 Solid

HOY
 Dashed
 above

Solutions: $(2, 4)$ $(1, 5)$

b.) $y \leq 3$
 $y > -x + 5$

HOY
 SOLID

$m = -1$
 $b = 5$

TP: $(0, 0)$
 $0 > -0 + 5$
 $0 > 5$
 False

Solutions: $(4, 2)$ $(5, 1)$

$$8x + 4y \leq 12$$

$$c.) \quad y > \frac{1}{2}x - 2$$

$$m = \frac{1}{2} \quad b = -2$$

dashed

$$TP: (0,0)$$

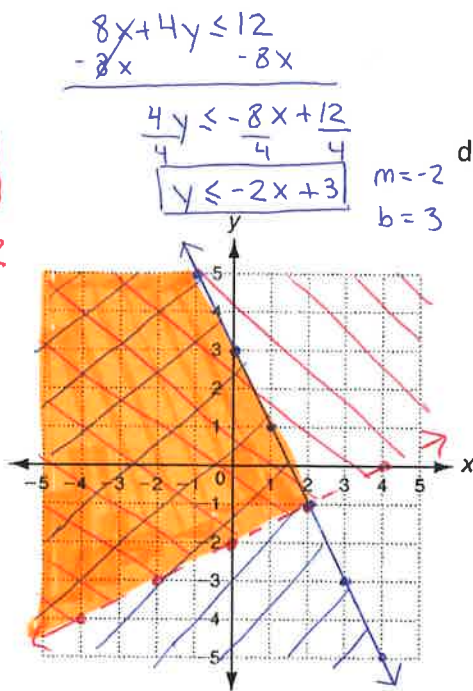
$$0 > \frac{1}{2}(0) - 2$$

$$0 > -2 \quad \checkmark$$

$$TP: (0,0)$$

$$8(0) + 4(0) \leq 12$$

$$0 \leq 12 \quad \checkmark$$



Solutions: $(0,0)$ $(-2,1)$

$$-3x + 2y \geq 2$$

$$d.) \quad y < 4x + 3$$

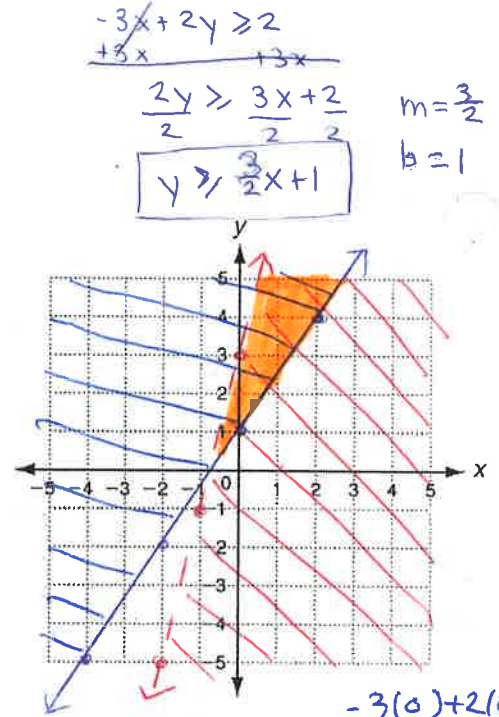
$$m = 4$$

$$b = 3$$

$$TP: (0,0)$$

$$0 < 4(0) + 3$$

$$0 < 3 \quad \checkmark$$



$$TP: (0,0)$$

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

$$0 \geq 2 \quad \times$$

Solutions: $(1,4)$ $(1,5)$

$$e.) \quad y < 2x - 3$$

$$y > 2x + 2$$

$$m = 2$$

$$b = 2$$

$$TP: (0,0)$$

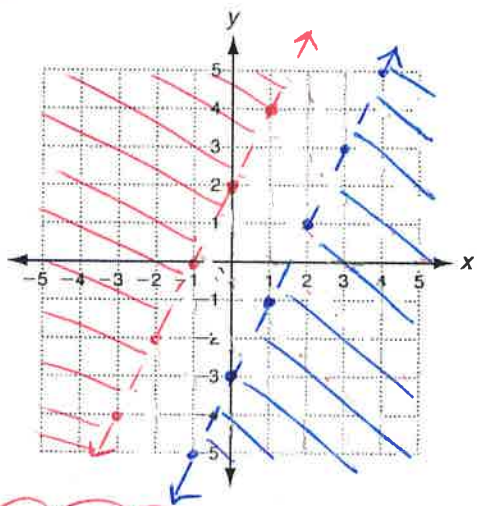
$$0 > 2(0) - 3$$

$$0 > 2 \quad \times$$

$$m = 2 \quad TP: (0,0)$$

$$b = -3 \quad 0 < 2(0) - 3$$

$$0 < -3 \quad \times$$



No overlap!

No Solution!

$$f.) \quad y > x - 3$$

$$y \leq x + 1$$

$$m = 1$$

$$b = 1$$

$$TP: (0,0)$$

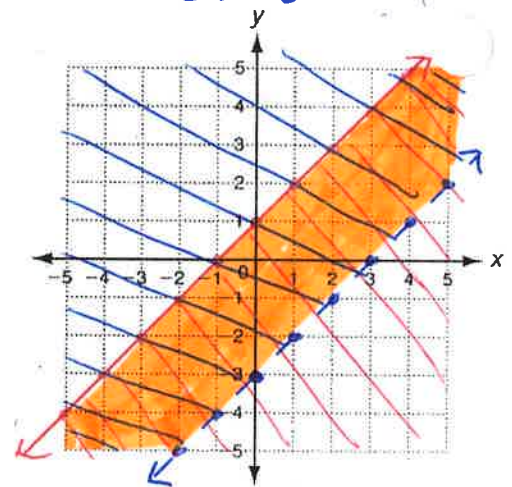
$$0 \leq 0 + 1$$

$$0 \leq 1 \quad \checkmark$$

$$m = 1 \quad TP: (0,0)$$

$$b = -3 \quad 0 > 0 - 3$$

$$0 > -3 \quad \checkmark$$



Solutions: $(0,-2)$
 $(-1,-3)$