

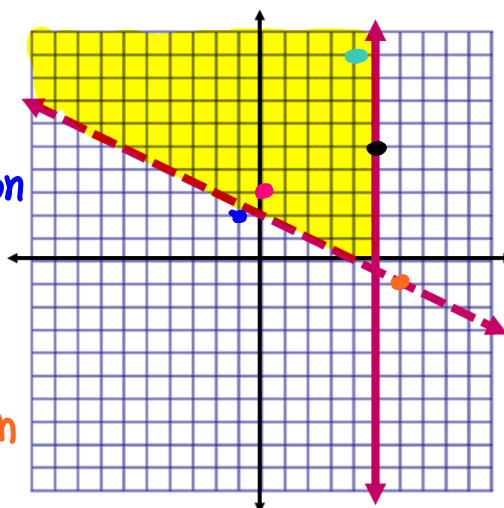
3.4 Systems of Linear Inequalities

- A collection of linear inequalities in the same variables
- The solution is any ordered pair that satisfies each of the inequalities of the system
- The graph of a system is the graph of all solutions of the system

Example 1

Tell whether the ordered pair is a solution.

- $(-1, 2)$ not a solution
- $(0, 3)$ solution
- $(4, 9)$ solution
- $(5, 5)$ solution
- $(6, -1)$ not a solution



Example 2

Graph the system.

$$x - 2y \leq 3$$

$$y > 3x - 4$$

$$\frac{x - 2y \leq 3}{-x} \quad \frac{-x - 2y \leq -x + 3}{-x}$$

$$\frac{-2y \leq -x + 3}{-2} \quad \frac{-x - 2y \leq -x + 3}{-2}$$

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

$$m = \frac{1}{2}$$

$$y\text{-int} = -\frac{3}{2}$$

solid line

shade above

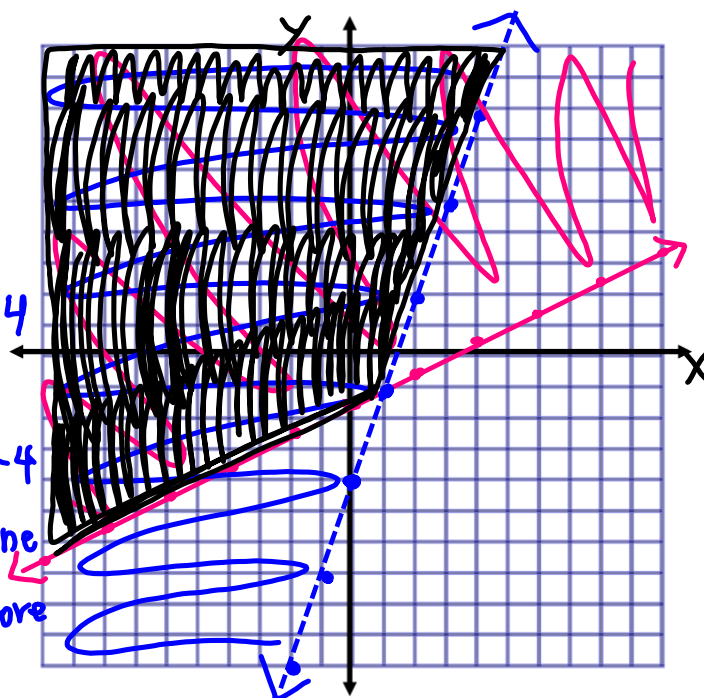
$$y > 3x - 4$$

$$m = 3$$

$$y\text{-int} = -4$$

dotted line

shade above

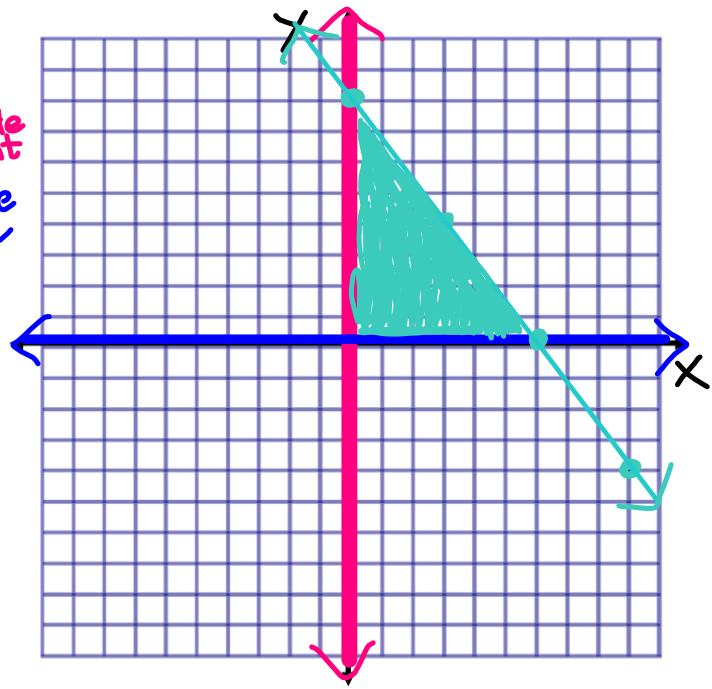


Example 3

Graph the system.

$$\begin{array}{l} \boxed{x \geq 0} \text{ vert/solid/shade right} \\ \boxed{y \geq 0} \text{ hor/solid/shade above} \end{array}$$

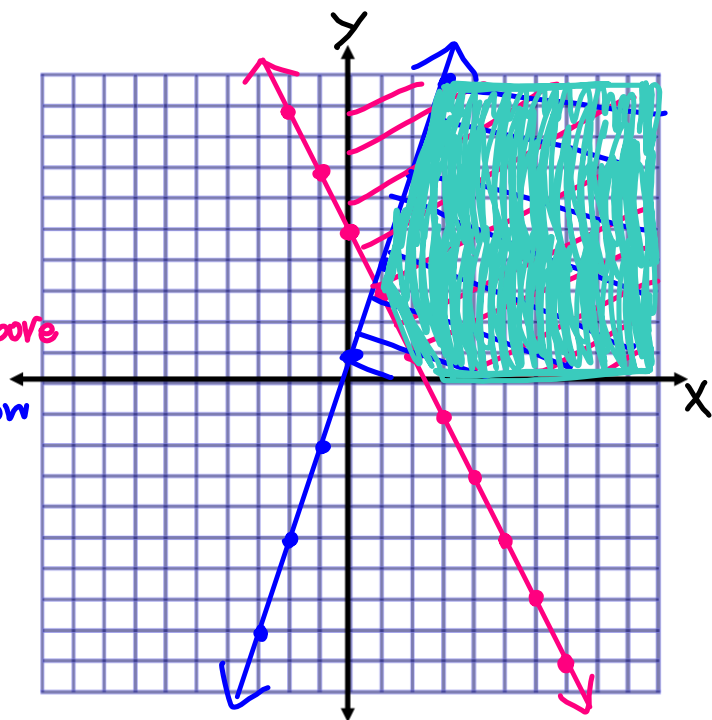
$$\begin{array}{r} 4x + 3y \leq 24 \\ -4x \quad -4x \\ \hline 3y \leq -4x + 24 \\ \frac{3y}{3} \leq \frac{-4x + 24}{3} \\ y \leq -\frac{4}{3}x + 8 \\ m = -\frac{4}{3} \\ y\text{-int} = 8 \\ \text{solid line} \\ \text{shade below} \end{array}$$

Example 4

Graph the system.

$$\begin{array}{l} \boxed{x \geq 0} \\ \boxed{y \geq 0} \end{array} \text{ QI}$$

$$\begin{array}{l} y \geq -2x + 5 \text{ solid shade above} \\ m = -2 \text{ y-int} = 5 \\ y \leq 3x + 1 \text{ solid shade below} \\ m = 3 \text{ y-int} = 1 \end{array}$$



Example 5

Graph the system.

$$\begin{cases} x \geq 0 \\ y \geq 0 \end{cases} \quad \text{QI}$$

$$x + y < 2$$

$$-2x - y \leq -3$$

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

$$y < -x + 2$$

$$m = -1$$

$$y\text{-int} = 2$$

dotted

shade
below

$$\begin{array}{r} -2x - y \leq -3 \\ +2x \quad +2x \\ \hline \end{array}$$

$$-y \leq 2x - 3$$

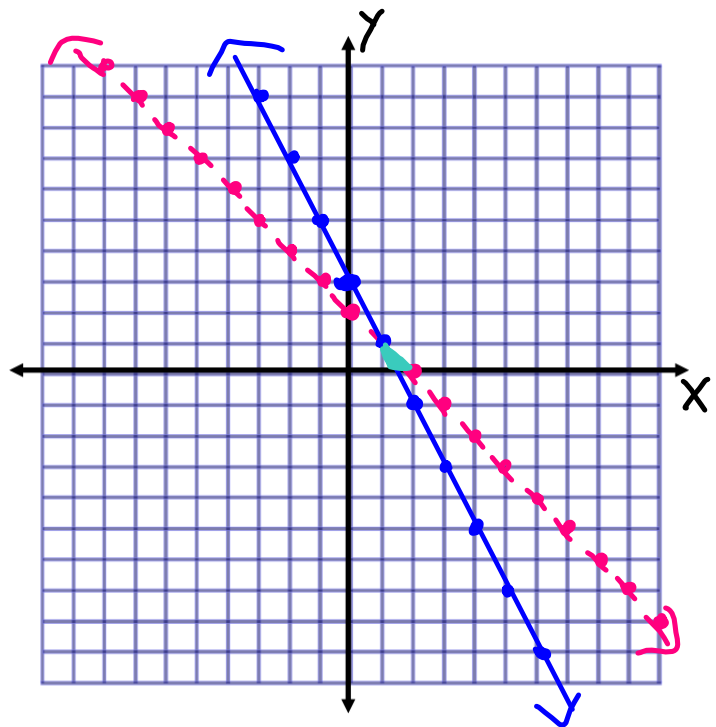
$$y \geq -2x + 3$$

$$m = -2$$

$$y\text{-int} = 3$$

solid

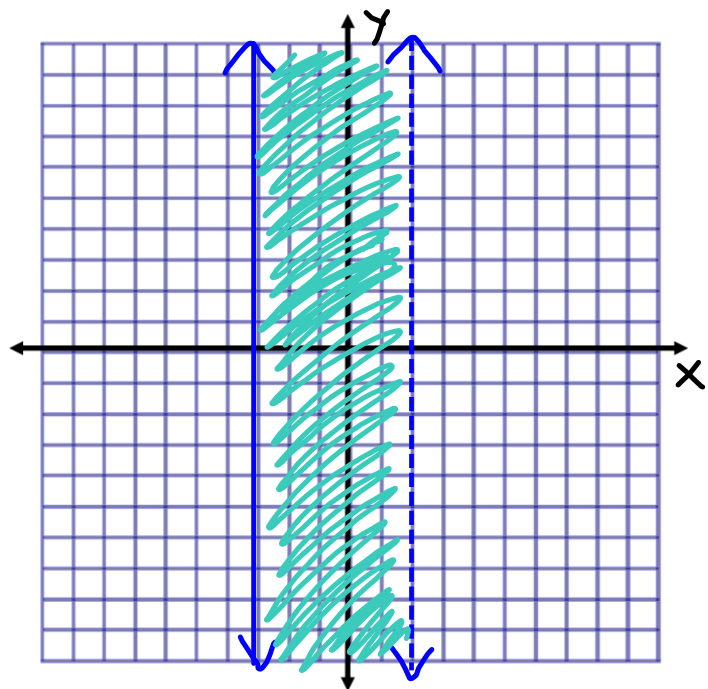
shade above

Example 6

Graph the system.

$$-3 \leq x < 2$$

\uparrow solid \uparrow vert \uparrow dotted

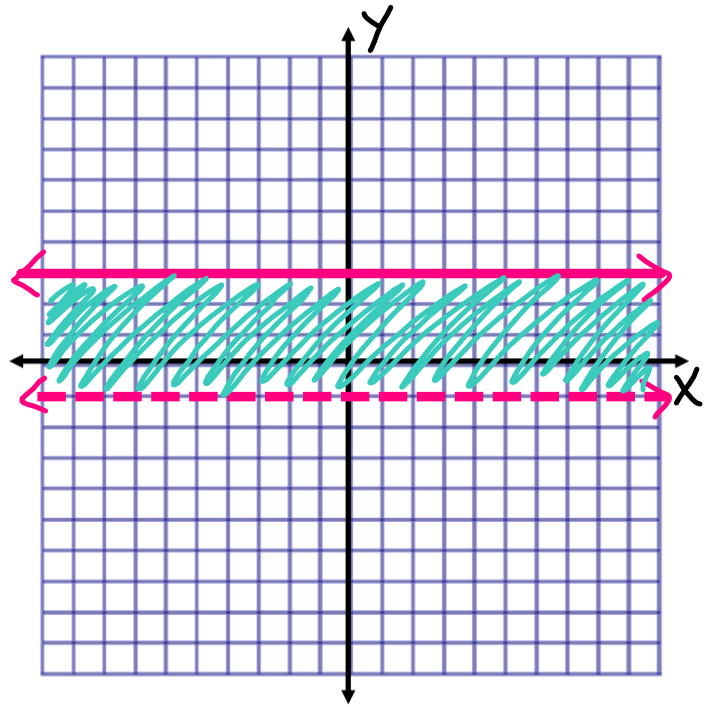


Example 7

Graph the system.

$$-1 < y \leq 3$$

dotted \swarrow \nearrow solid
 hor.

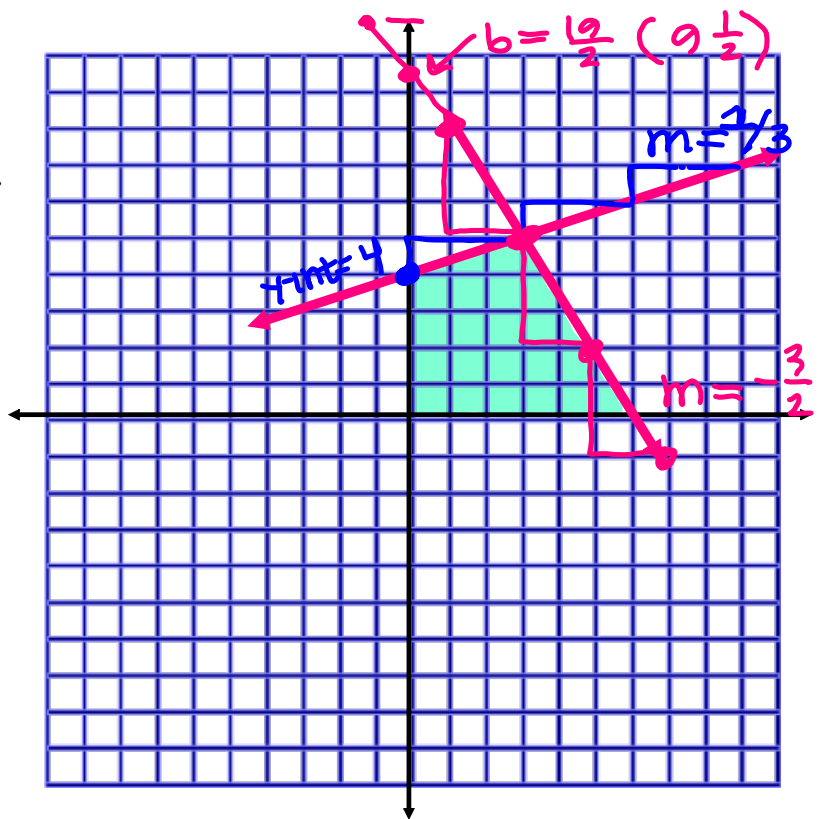
Example 8

Write the system of inequalities graphed.

$$QI \begin{cases} x \geq 0 \\ y \geq 0 \end{cases}$$

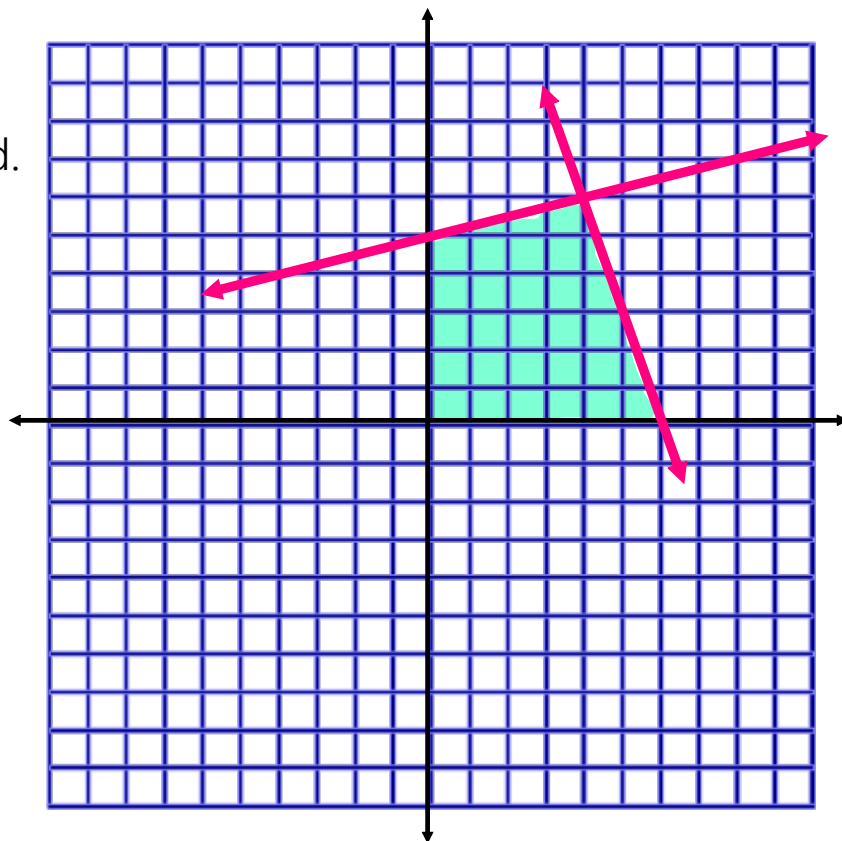
$$y \leq \frac{1}{3}x + 4$$

$$y \leq -\frac{3}{2}x + \frac{19}{2}$$



Example 9

Write the system of inequalities graphed.

Example 10

Write the system of inequalities graphed.

$$y \geq -2$$

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

$$y \leq 2x + 6$$

