

Definition

A solution to an inequality in 2 variables is an ordered pair that makes the inequality true.

Example 1

Is $(9, -2)$ a solution to the inequality $2x + 3y \geq 5$?

Example 2

Is $(6, 4)$ a solution to the inequality $x < 5$?

Example 3

Is $(0, 1)$ a solution to the inequality $y \leq 4x + 1$?

Example 4

Is $(3, -2)$ a solution to the inequality $4x + 6y < 0$?

Fact

Other than a couple of exceptional cases, the solution set to a linear inequality in 2 variables is a half plane. Graphs are the most common way we communicate solution sets to linear inequalities in 2 variables.

Strategy 1 for graphing the solution set to a linear inequality in 2 variables

Begin by isolating y **on the left side** of the inequality symbol.

- If the inequality has form $y \geq mx + b$ the solution set is all points **on or above the line** $y = mx + b$. Draw the line $y = mx + b$ and shade above the line.
- If the inequality has form $y > mx + b$ the solution set is all points **above the line** $y = mx + b$. Draw a **dotted** line $y = mx + b$ and shade above the line.
- If the inequality has form $y \leq mx + b$ the solution set is all points **on or below the line** $y = mx + b$. Draw the line $y = mx + b$ and shade below the line.
- If the inequality has form $y < mx + b$ the solution set is all points **below the line** $y = mx + b$. Draw a **dotted** line $y = mx + b$ and shade below the line.

Example 5

Graph onto Figure 1 the solution set to the inequality $y \geq \frac{1}{2}x - 2$.

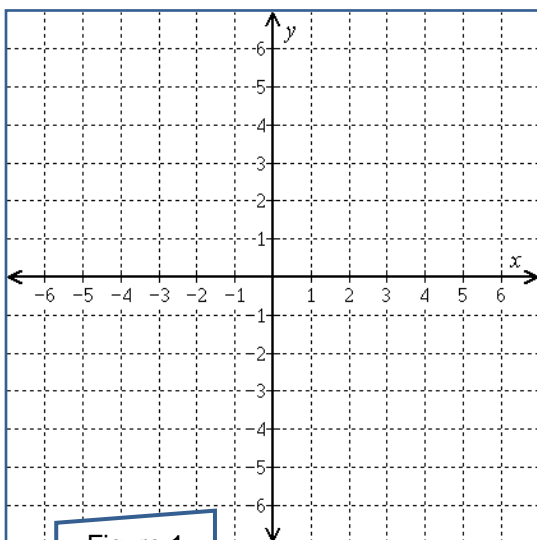


Figure 1

Example 6

Graph onto Figure 2 the solution set to the inequality $y < 2 - x$.

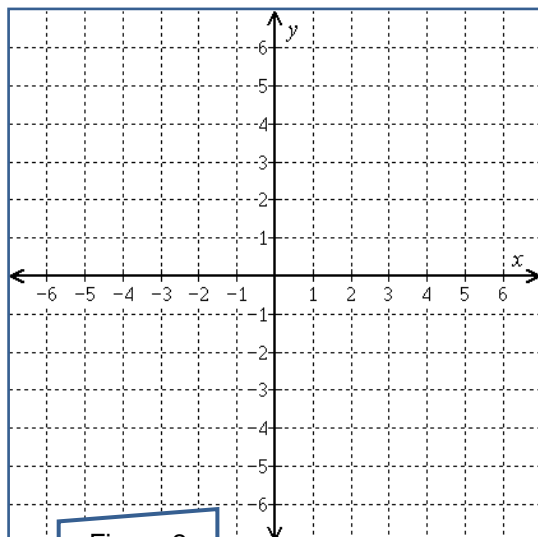


Figure 2

Example 7

Graph onto Figure 3 the solution set to the inequality $3x + 4y \geq 8$.

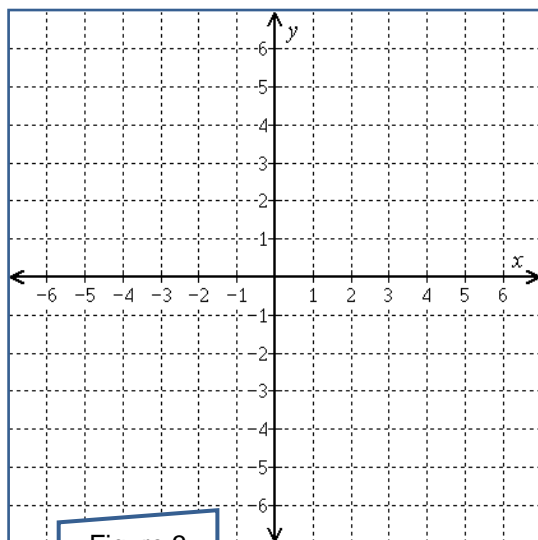


Figure 3

Example 8

Graph onto Figure 4 the solution set to the inequality $x - 3y > -6$.

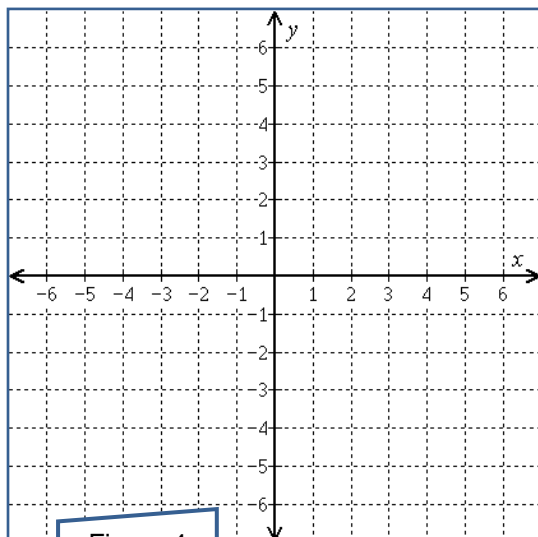


Figure 4

Example 9

Graph onto Figure 5 the solution set to the inequality $-2x - 5y > 4$.

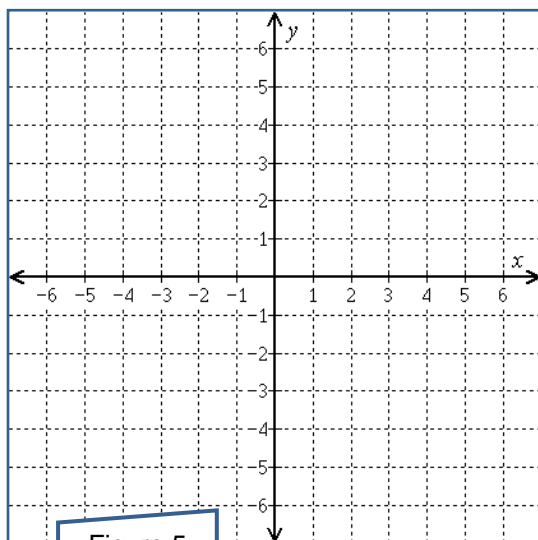


Figure 5

Strategy 2 for graphing the solution set to a linear inequality in 2 variables

Begin by graphing the boundary line that results from replacing the inequality sign with an equal sign. Remember to use a solid line if the inequality symbol is \leq or \geq and a dotted line if the inequality symbol is $<$ or $>$.

Next, test a point **not on the line** in **the inequality**.

- If the point makes the inequality **true** shade **that side** of the line.
- If the point makes the inequality **false** shade **the other side** of the line.

Example 10

Graph onto Figure 6 the solution set to the inequality $4x + 3y \geq 12$.

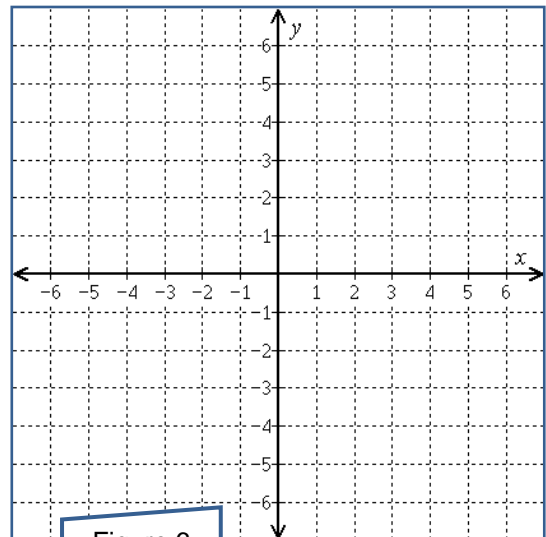


Figure 6

Example 11

Graph onto Figure 7 the solution set to the inequality $x \geq 3$.

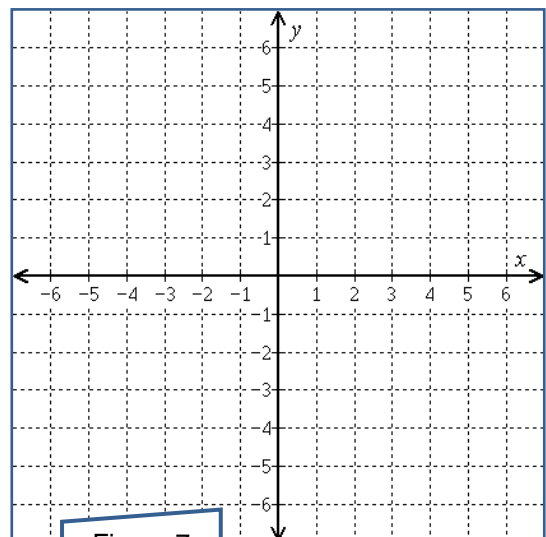


Figure 7

Example 12

Graph onto Figure 8 the solution set to the inequality $-5x - 2y \geq 0$.

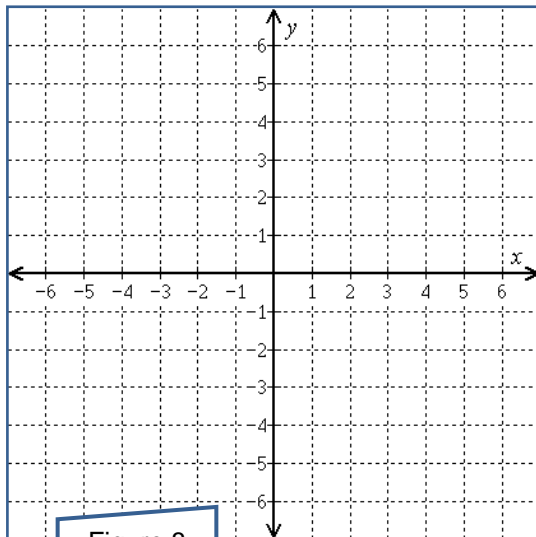


Figure 8

Example 13

Find inequalities that would graph to the sets indicated in figures 9 and 10.

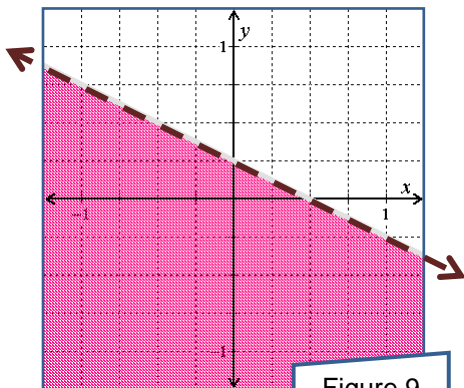


Figure 9

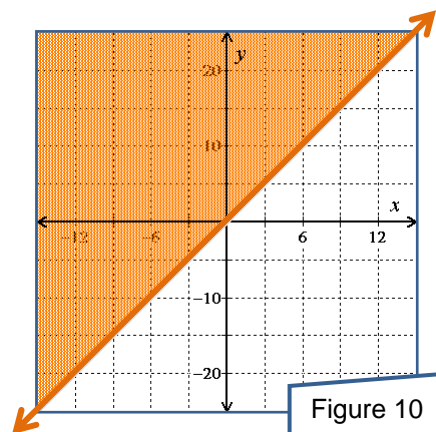


Figure 10