6.7 Graph Linear Inequalities in Two Variables

Goal • Graph linear inequalities in two variables.

Your Notes

VOCABULARY

Linear inequality in two variables A linear inequality in two variables is the result of replacing the = sign in a linear equation with <, ≤, >, or ≥.

Graph of an inequality in two variables The set of points that represent all solutions of the inequality

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Example 1 *Check solutions of a linear inequality*

Tell whether the ordered pair is a solution of 3x − 4y > 9.

a. (2, 0)   **b.** (2, −1)

Solution

a. Test (2, 0):

3x − 4y > 9	**Write inequality.**
3(_2_) − 4(_0_) > 9	**Substitute** _2_ **for** x **and** _0_ **for** y.
_6_ > 9	**Simplify.**

(2, 0) _is not_ a solution.

b. Test (2, −1):

3x − 4y > 9	**Write inequality.**
3(_2_) − 4(_−1_) > 9	**Substitute** _2_ **for** x **and** _−1_ **for** y.
_10_ > 9	**Simplify.**

(2, −1) _is_ a solution.

GRAPHING A LINEAR INEQUALITY IN TWO VARIABLES

Step 1 **Graph** the boundary line. Use a __dashed__ line for < or >, and use a __solid__ line for ≤ or ≥.

Step 2 **Test** a point not on __the boundary line__ by checking whether the ordered pair is a solution of the inequality.

Step 3 **Shade** the __half-plane__ containing the point if the ordered pair __is__ a solution of the inequality. Shade the __other half-plane__ if the ordered pair __is not__ a solution.

Example 2   *Graph a linear inequality in two variables*

Graph the inequality $y < -\frac{1}{2}x + 4$.

Solution

1. **Graph** the equation $y = -\frac{1}{2}x + 4$. The inequality is <, so use a __dashed__ line.

2. **Test** (0, 0) in $y < -\frac{1}{2}x + 4$.

$$\underline{\ 0\ } < -\frac{1}{2}(\underline{\ 0\ }) + 4$$

$$\underline{\ 0\ } < \underline{\ 4\ }$$

3. __Shade__ the half-plane that __contains__ (0, 0) because (0, 0) __is__ a solution of the inequality.
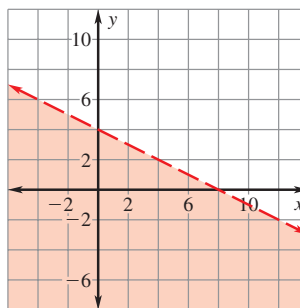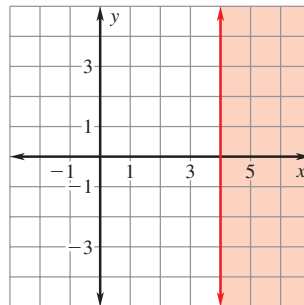
Example 3 *Graph a linear inequality in one variable*
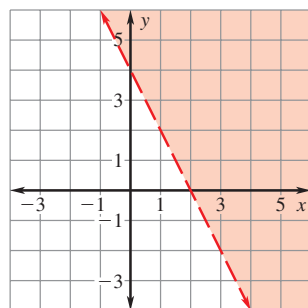
Graph the inequality $x \geq 4$.

Solution

1. **Graph** the equation $x = 4$. The inequality is $\geq$, so use a __solid__ line.

2. **Test** $(0, 3)$ in $x \geq 4$. You only substitute the __x-coordinate__ because the inequality does not have the variable __y__.

   __0__ ≥ 4

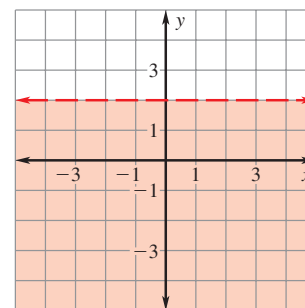3. __Shade__ the half-plane that __does not contain__ $(0, 3)$, because $(0, 3)$ __is not__ a solution of the inequality.

✔ *Checkpoint* **Graph the inequality.**

1. $2y + 4x > 8$

2. $y < 2$

Homework