

# Graphical Solutions of Systems of Linear Inequalities in Two Variables

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# How to Solve Systems of Linear Inequalities by Graphical Method?

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1. Draw the graphs of both inequalities on the same Cartesian plane.
2. Determine the solution of the system by labeling the intersection region of all the solutions in the system.

# Example 1

Show the graph of the solution of the following system of linear inequalities:

$$\begin{cases} y \leq 2x + 1 \\ x + y > -1 \end{cases}$$

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Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$y \leq 2x + 1$$

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$$b = 1$$

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**Second inequality**       **$x + y > -1$**

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Simplify       $x = -1$

Coordinates       $(-1, 0)$

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Simplify       $y = -1$

Coordinates       $(0, -1)$

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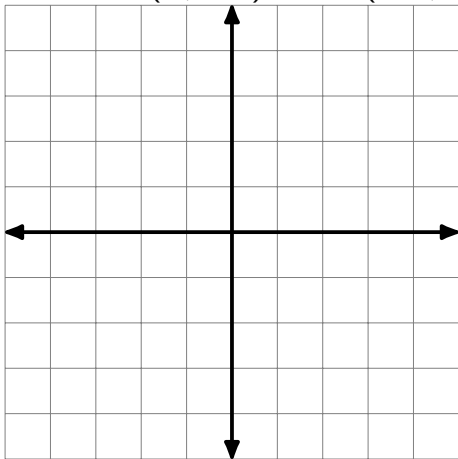
- ▶  $m = \frac{\text{rise}}{\text{run}} = 2$  and  $b = 1$  for  $y \leq 2x + 1$
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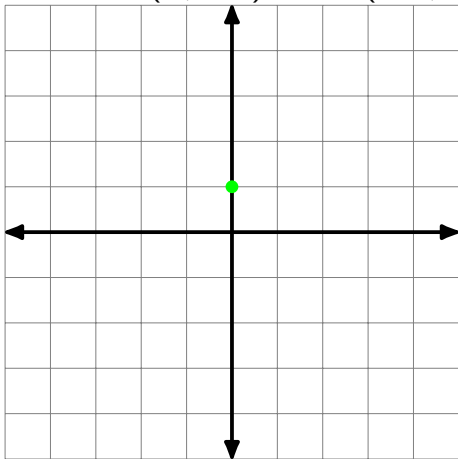


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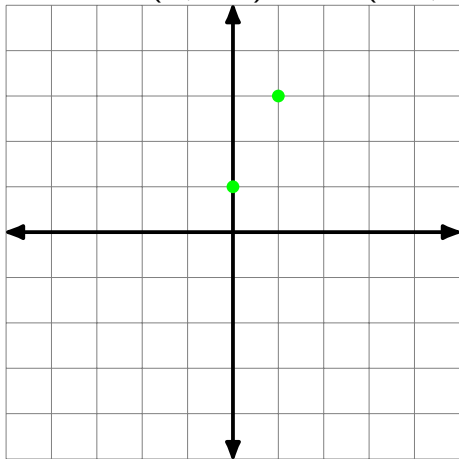


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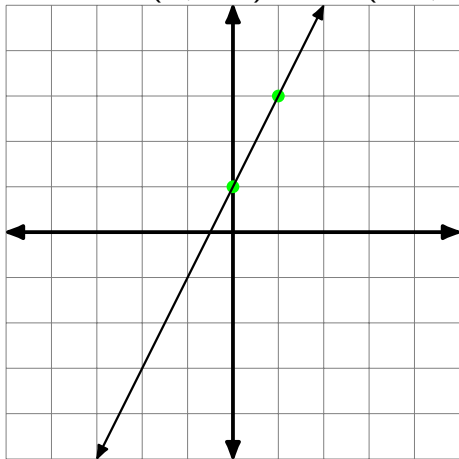


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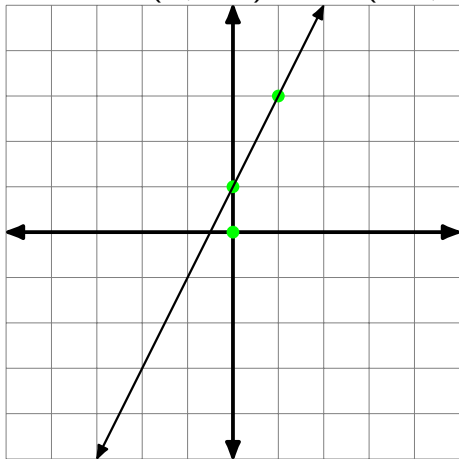


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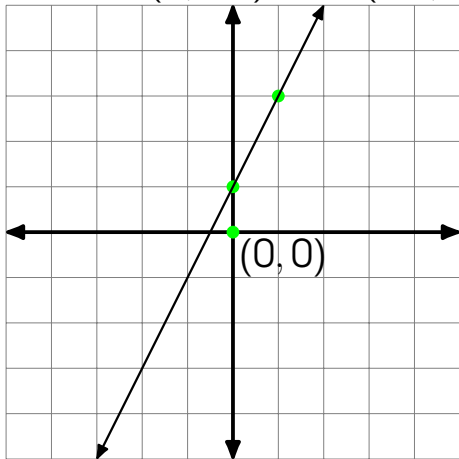


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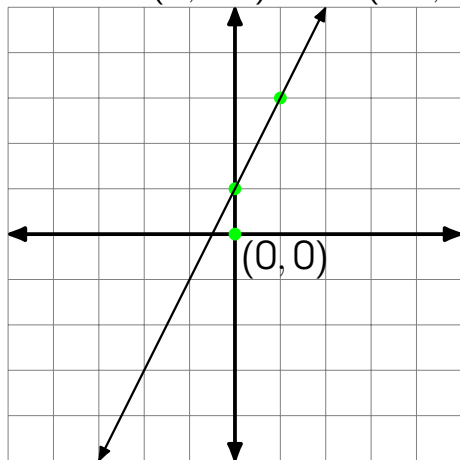


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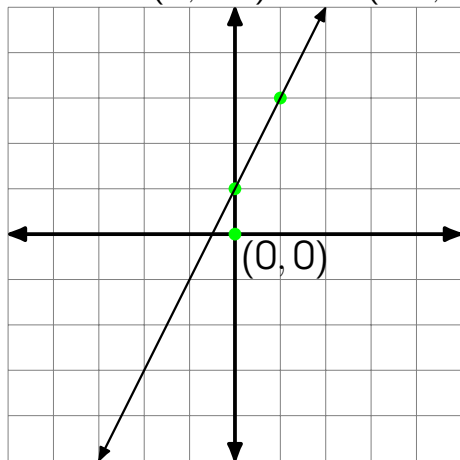
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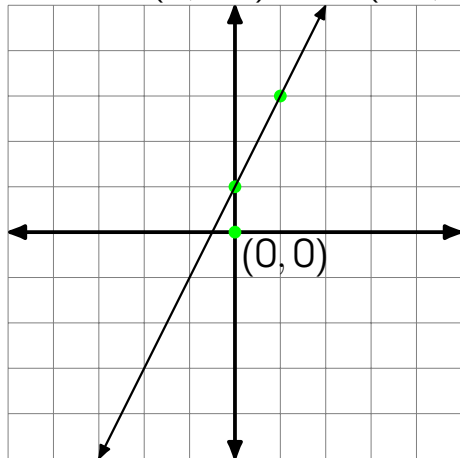
$$y \leq 2x + 1$$
$$0 \leq 2(0) + 1$$

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$$\begin{aligned} y &\leq 2x + 1 \\ 0 &\leq 2(0) + 1 \\ 0 &\leq 0 + 1 \end{aligned}$$

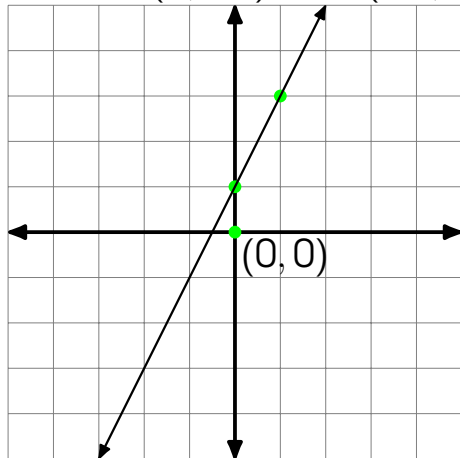


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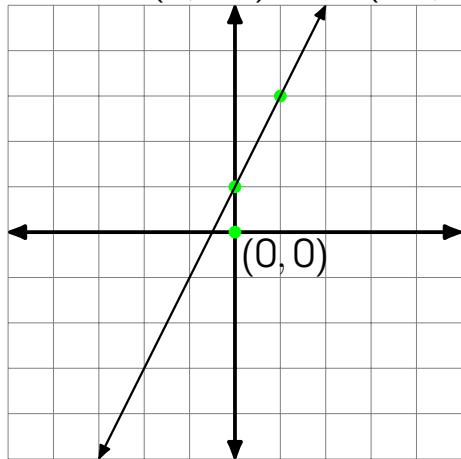
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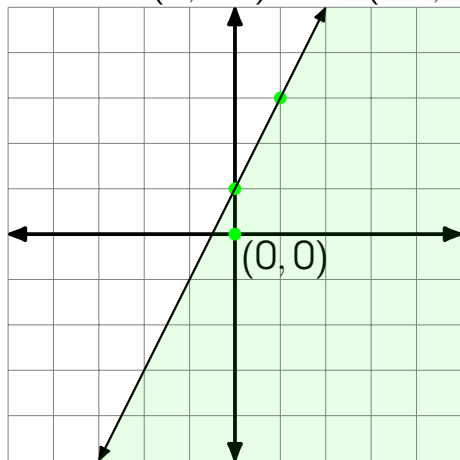
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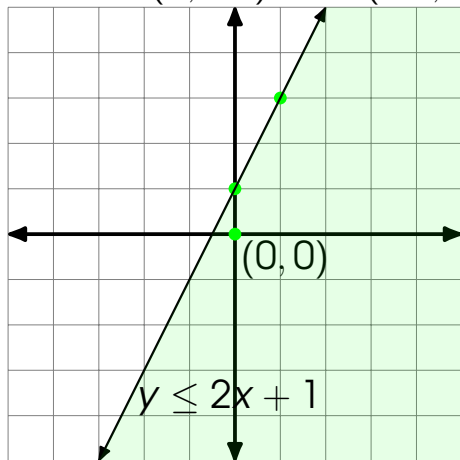
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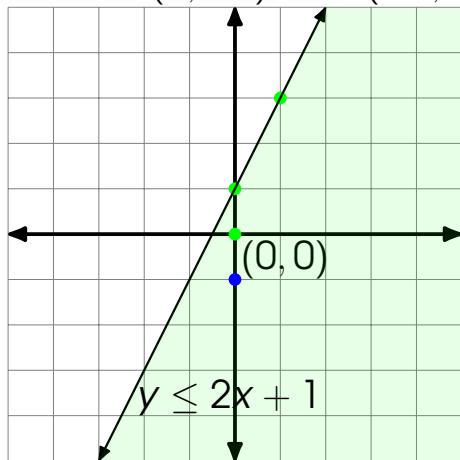
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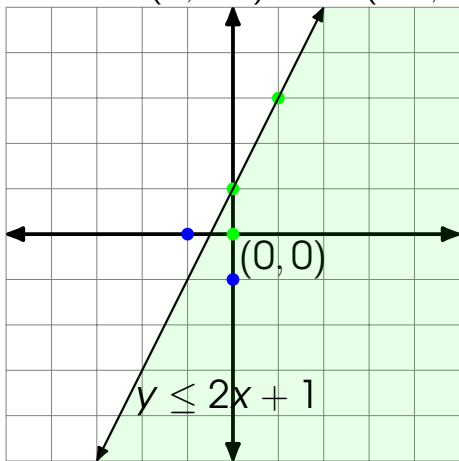


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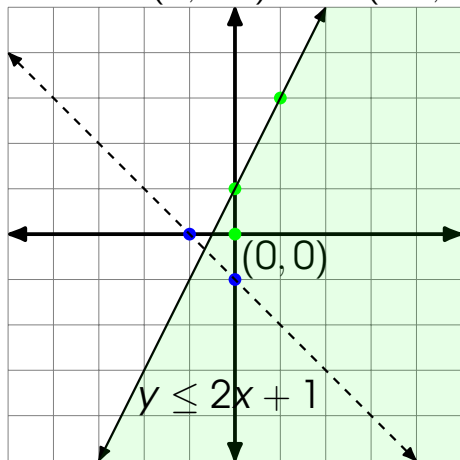


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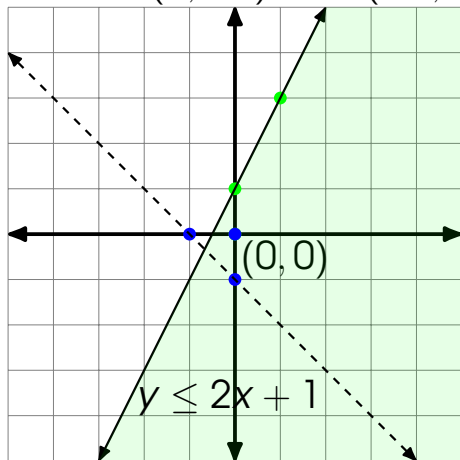


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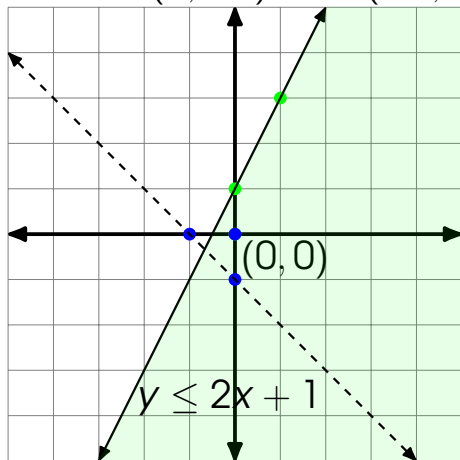


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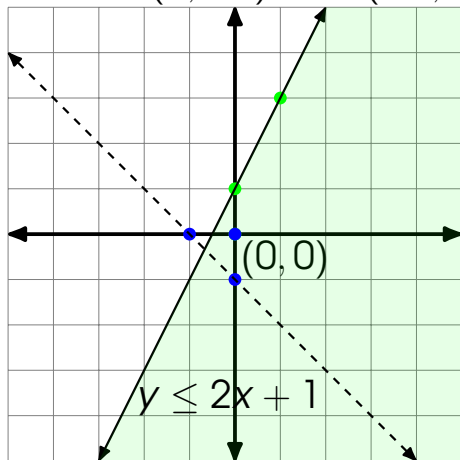
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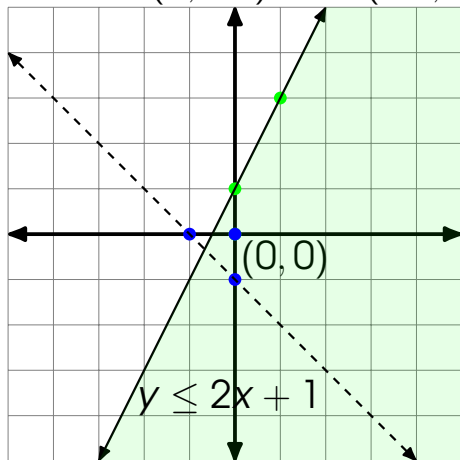
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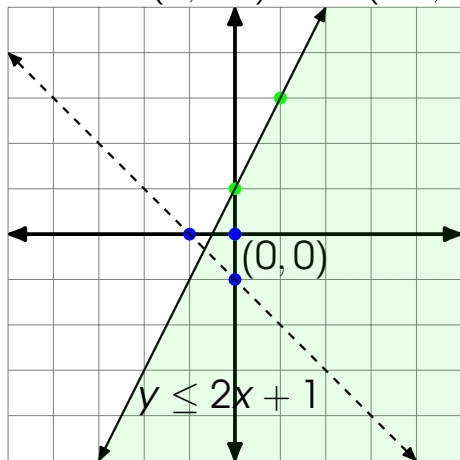
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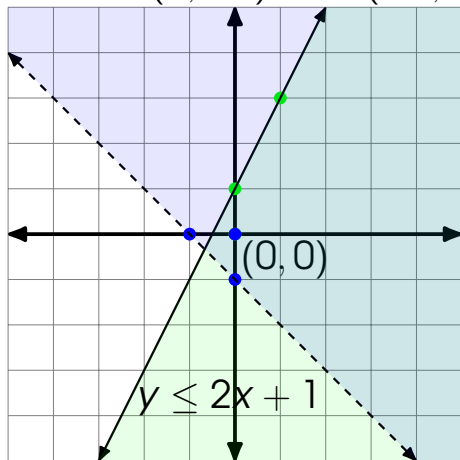
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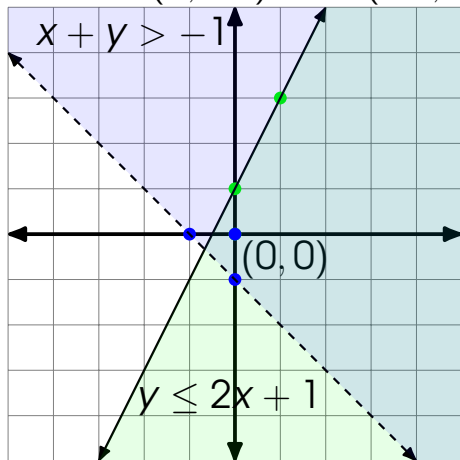
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# Example 1

Step 2: Determine the solution of the system by labeling the intersection region of all the solutions in the system.

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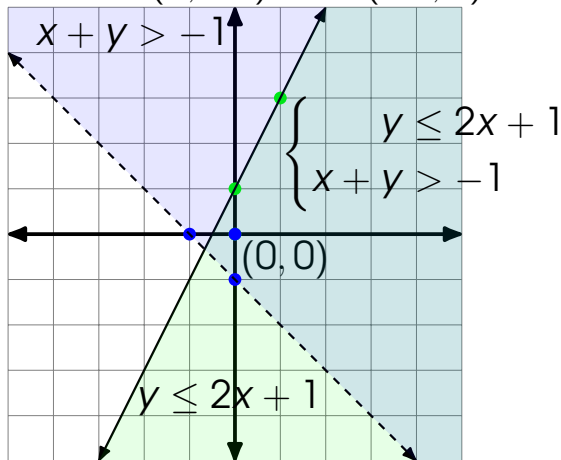
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# Example 2

Show the graph of the solution of the following system of linear inequalities:

$$\begin{cases} y > \frac{4}{5}x - 2 \\ y \leq -2x + 3 \end{cases}$$



# Example 2

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$y > \frac{4}{5}x - 2$$

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Change  $>$  to  $=$

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$$y > \frac{4}{5}x - 2$$

$$y = \frac{4}{5}x - 2$$

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Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

Change  $>$  to  $=$

$$m = \frac{4}{5}$$

$$y > \frac{4}{5}x - 2$$

$$y = \frac{4}{5}x - 2$$

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Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

Change  $>$  to  $=$

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$$y > \frac{4}{5}x - 2$$

$$y = \frac{4}{5}x - 2$$

$$b = -2$$

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Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**Second inequality**

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

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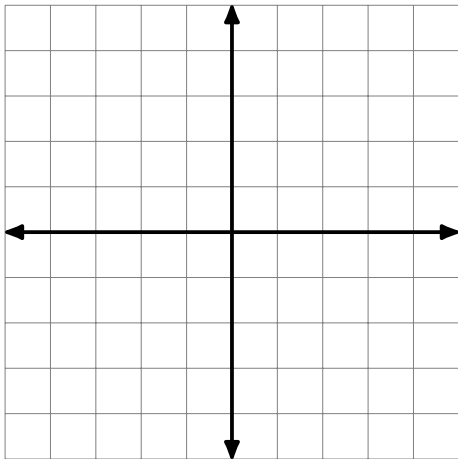
- ▶  $m = \frac{\text{rise}}{\text{run}} = \frac{4}{5}$  and  $b = -2$  for  $y > \frac{4}{5}x - 2$
- ▶  $m = -2$  and  $b = 3$  for  $y \leq -2x + 3$

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Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

Plot:

- ▶  $m = \frac{\text{rise}}{\text{run}} = \frac{4}{5}$  and  $b = -2$  for  $y > \frac{4}{5}x - 2$
- ▶  $m = -2$  and  $b = 3$  for  $y \leq -2x + 3$

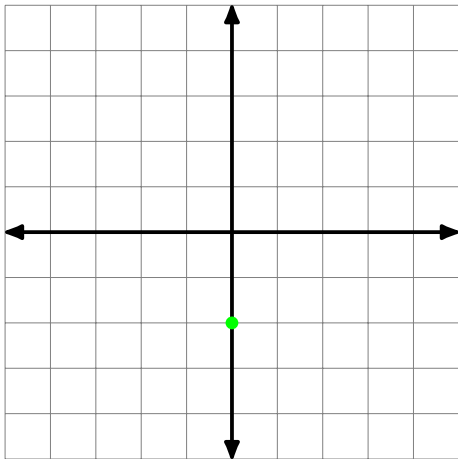


# Example 2

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- ▶  $m = \frac{\text{rise}}{\text{run}} = \frac{4}{5}$  and  $b = -2$  for  $y > \frac{4}{5}x - 2$
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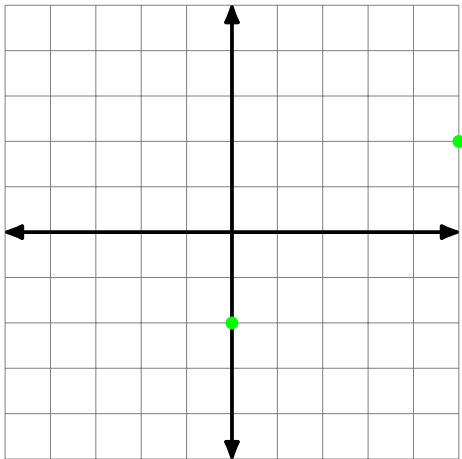


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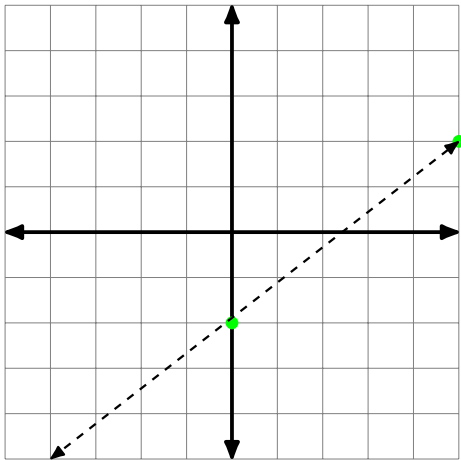


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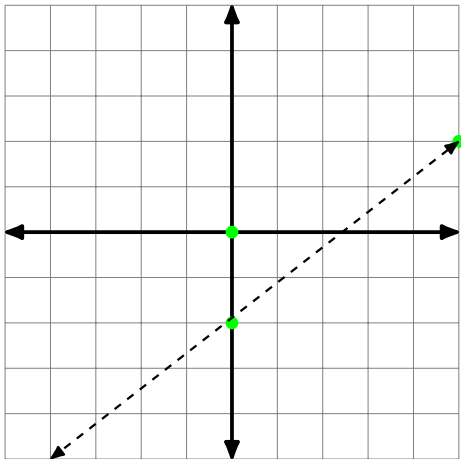


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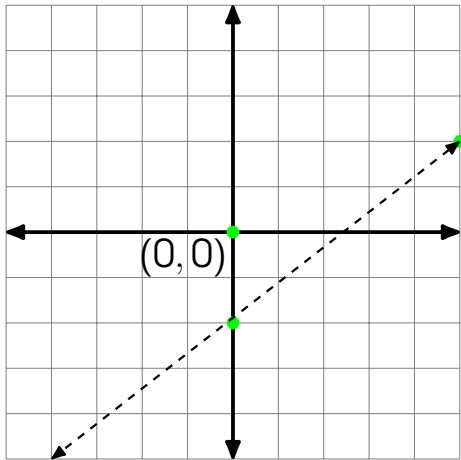


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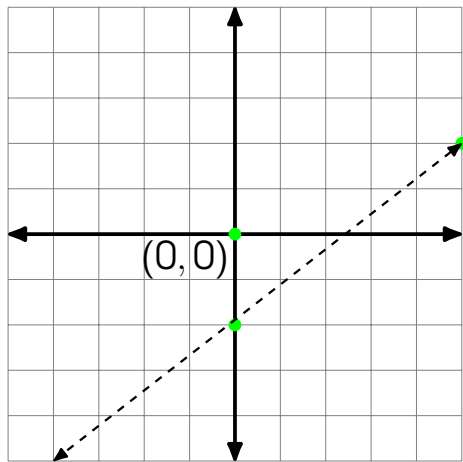


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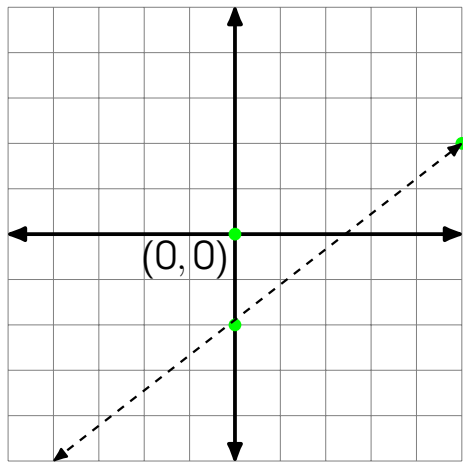
$$y > \frac{4}{5}x - 2$$

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$$y > \frac{4}{5}x - 2$$

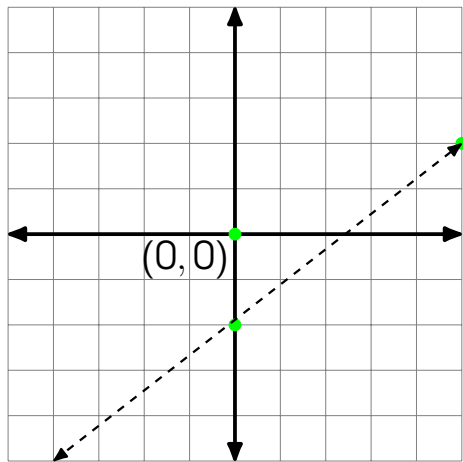
$$0 > \frac{4}{5}(0) - 2$$

# Example 2

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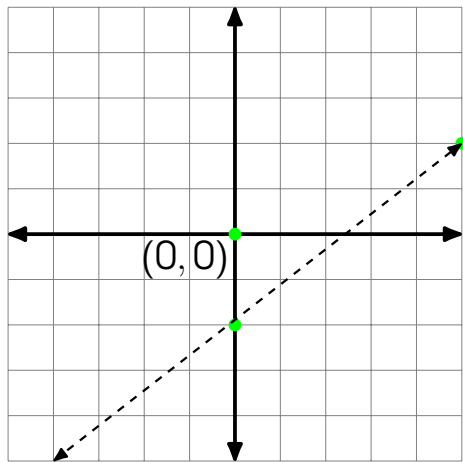
$$0 > 0 - 2$$

# Example 2

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$$y > \frac{4}{5}x - 2$$

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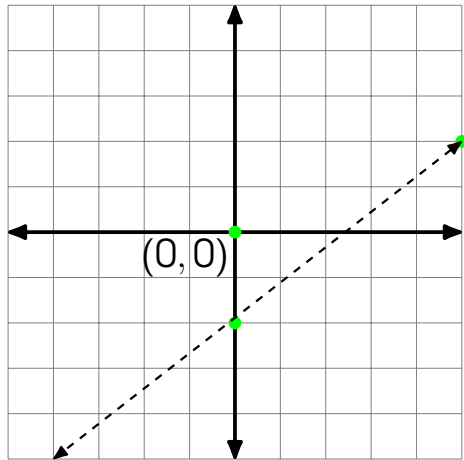
$$0 > -2$$

# Example 2

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

Plot:

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$$y > \frac{4}{5}x - 2$$

$$0 > \frac{4}{5}(0) - 2$$

$$0 > 0 - 2$$

$$0 > -2 \checkmark$$

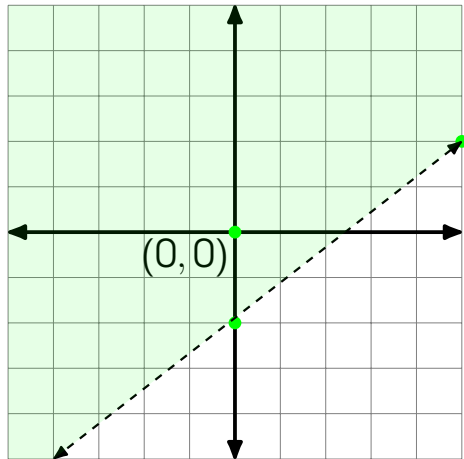


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$$0 > \frac{4}{5}(0) - 2$$

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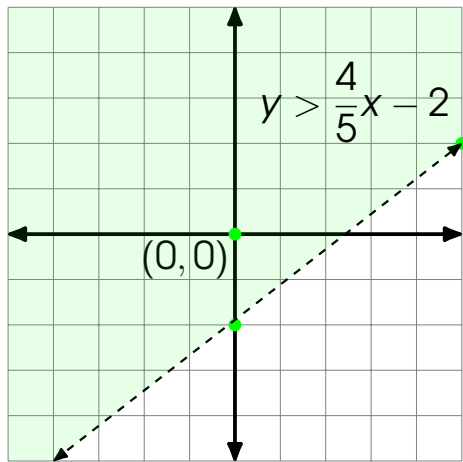
$$0 > -2 \checkmark$$

# Example 2

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

Plot:

- ▶  $m = \frac{\text{rise}}{\text{run}} = \frac{4}{5}$  and  $b = -2$  for  $y > \frac{4}{5}x - 2$
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$$y > \frac{4}{5}x - 2$$

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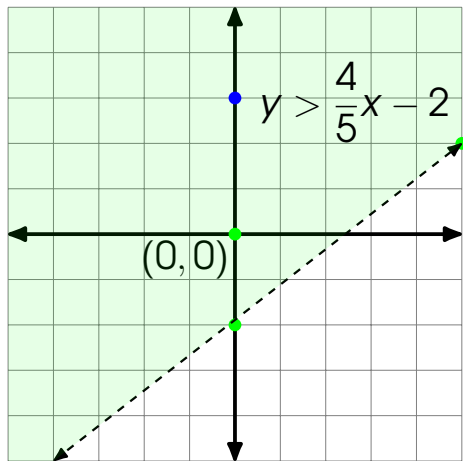
$$0 > -2 \checkmark$$

# Example 2

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

Plot:

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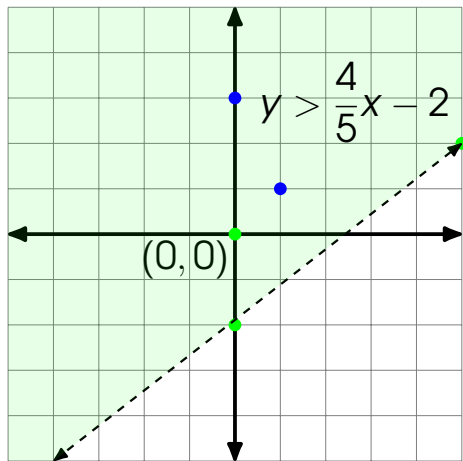


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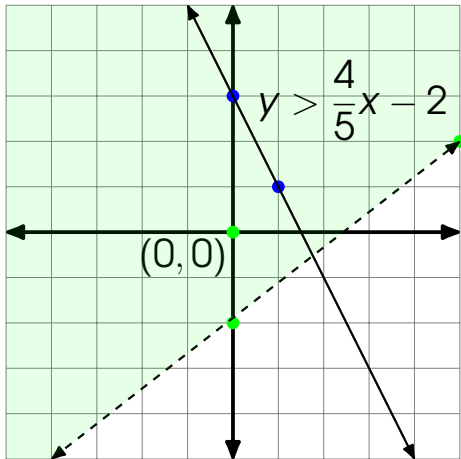


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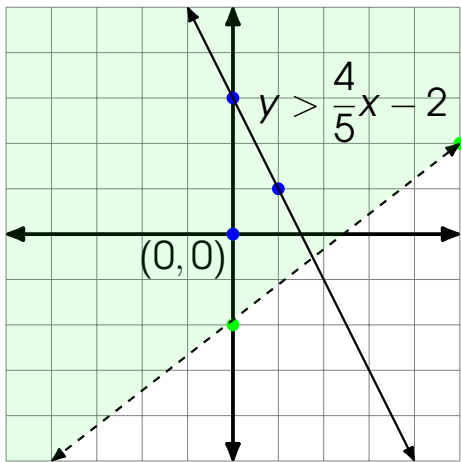


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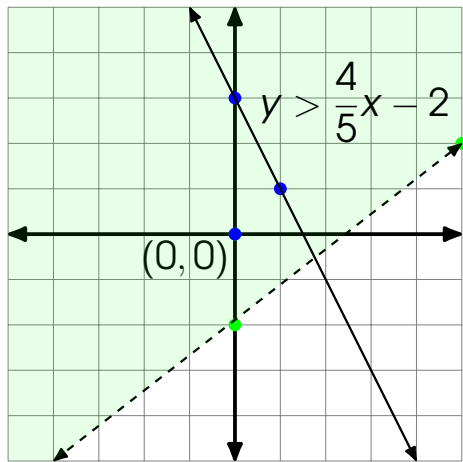


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- ▶  $m = \frac{\text{rise}}{\text{run}} = \frac{4}{5}$  and  $b = -2$  for  $y > \frac{4}{5}x - 2$
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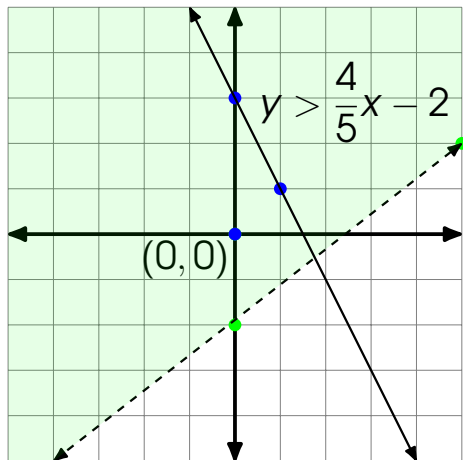
$$y \leq -2x + 3$$

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$$y \leq -2x + 3$$
$$0 \leq -2(0) + 3$$

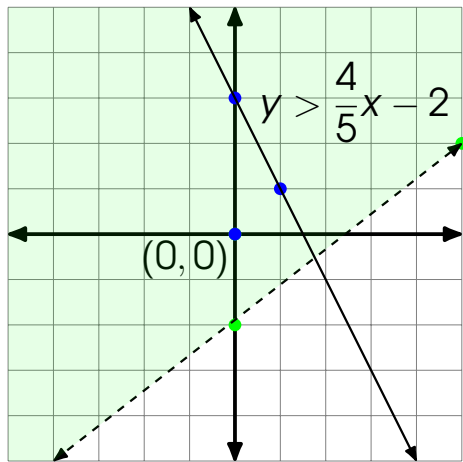


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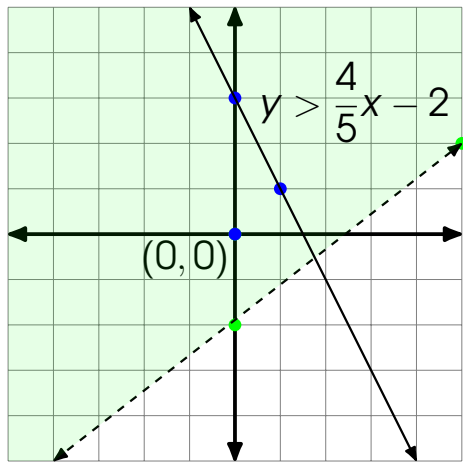
$$\begin{aligned}y &\leq -2x + 3 \\0 &\leq -2(0) + 3 \\0 &\leq 0 + 3\end{aligned}$$

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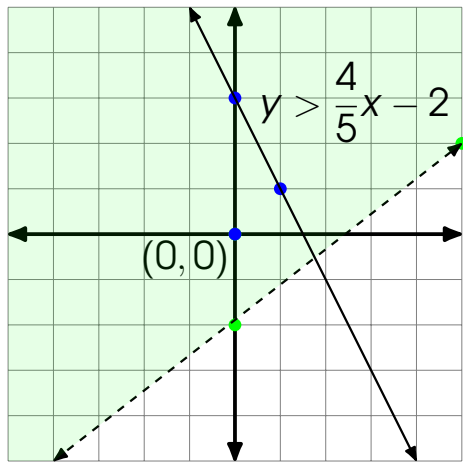
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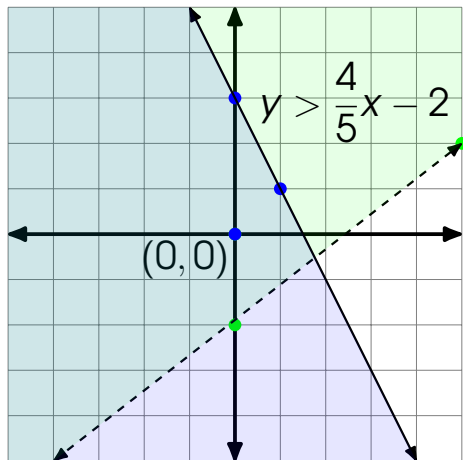
$$\begin{aligned}y &\leq -2x + 3 \\ 0 &\leq -2(0) + 3 \\ 0 &\leq 0 + 3 \\ 0 &\leq 3 \checkmark\end{aligned}$$

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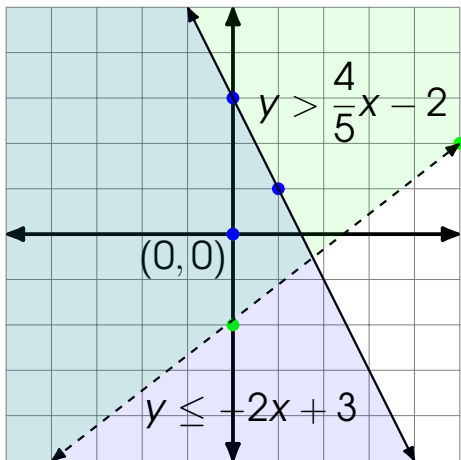
$$\begin{aligned}y &\leq -2x + 3 \\0 &\leq -2(0) + 3 \\0 &\leq 0 + 3 \\0 &\leq 3 \checkmark\end{aligned}$$

# Example 2

Step 2: Determine the solution of the system by labeling the intersection region of all the solutions in the system.

Plot:

- ▶  $m = \frac{\text{rise}}{\text{run}} = \frac{4}{5}$  and  $b = -2$  for  $y > \frac{4}{5}x - 2$
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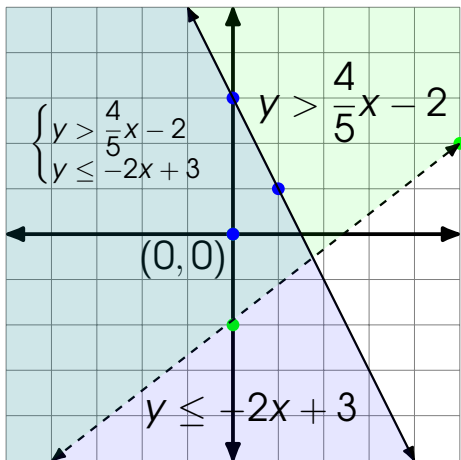


# Example 2

Step 2: Determine the solution of the system by labeling the intersection region of all the solutions in the system.

Plot:

- ▶  $m = \frac{\text{rise}}{\text{run}} = \frac{4}{5}$  and  $b = -2$  for  $y > \frac{4}{5}x - 2$
- ▶  $m = -2$  and  $b = 3$  for  $y \leq -2x + 3$



# Example 3

Show the graph of the solution of the following system of linear inequalities:

$$\begin{cases} x - 2y < -2 \\ y \leq -4x - 1 \end{cases}$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$



# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the x-intercept:

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the x-intercept:

$$\text{Let } y = 0$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the x-intercept:

$$\text{Let } y = 0$$

$$x - 2(0) = -2$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the x-intercept:

Let  $y = 0$

$$x - 2(0) = -2$$

Simplify

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

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Find the x-intercept:

Let  $y = 0$

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Simplify

$$x - 0 = -2$$

# Example 3

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Change  $<$  to  $=$

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Find the x-intercept:

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Simplify

$$x - 0 = -2$$

Simplify



# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

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Change  $<$  to  $=$

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Find the x-intercept:

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Simplify

$$x - 0 = -2$$

Simplify

$$x = -2$$

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Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

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Change  $<$  to  $=$

$$x - 2y = -2$$

Find the x-intercept:

Let  $y = 0$

$$x - 2(0) = -2$$

Simplify

$$x - 0 = -2$$

Simplify

$$x = -2$$

Coordinates

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the x-intercept:

Let  $y = 0$

$$x - 2(0) = -2$$

Simplify

$$x - 0 = -2$$

Simplify

$$x = -2$$

Coordinates

$$(-2, 0)$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

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Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

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Change  $<$  to  $=$

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Find the y-intercept:

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the y-intercept:

Let  $x = 0$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the y-intercept:

Let  $x = 0$

$$0 - 2y = -2$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the y-intercept:

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$$0 - 2y = -2$$

Simplify



# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the y-intercept:

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$$0 - 2y = -2$$

Simplify

$$-2y = -2$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the y-intercept:

Let  $x = 0$

$$0 - 2y = -2$$

Simplify

$$-2y = -2$$

Use Division Prop.

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the y-intercept:

Let  $x = 0$

$$0 - 2y = -2$$

Simplify

$$-2y = -2$$

Use Division Prop.

$$\frac{-2y}{-2} = \frac{-2}{-2}$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the y-intercept:

Let  $x = 0$

$$0 - 2y = -2$$

Simplify

$$-2y = -2$$

Use Division Prop.

$$\frac{-2y}{-2} = \frac{-2}{-2}$$

Simplify

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the y-intercept:

Let  $x = 0$

$$0 - 2y = -2$$

Simplify

$$-2y = -2$$

Use Division Prop.

$$\frac{-2y}{-2} = \frac{-2}{-2}$$

Simplify

$$y = 1$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the y-intercept:

Let  $x = 0$

$$0 - 2y = -2$$

Simplify

$$-2y = -2$$

Use Division Prop.

$$\frac{-2y}{-2} = \frac{-2}{-2}$$

Simplify

$$y = 1$$

Coordinates

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**First inequality**

$$x - 2y < -2$$

Change  $<$  to  $=$

$$x - 2y = -2$$

Find the y-intercept:

Let  $x = 0$

$$0 - 2y = -2$$

Simplify

$$-2y = -2$$

Use Division Prop.

$$\frac{-2y}{-2} = \frac{-2}{-2}$$

Simplify

$$y = 1$$

Coordinates

$$(0, 1)$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**Second inequality**       **$y \leq -4x - 1$**



# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**Second inequality**       $y \leq -4x - 1$

Change  $\leq$  to  $=$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**Second inequality**

$$y \leq -4x - 1$$

Change  $\leq$  to  $=$

$$y = -4x - 1$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**Second inequality**

$$y \leq -4x - 1$$

Change  $\leq$  to  $=$

$$y = -4x - 1$$

$$m = -4$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

**Second inequality**

$$y \leq -4x - 1$$

Change  $\leq$  to  $=$

$$y = -4x - 1$$

$$m = -4$$

$$b = -1$$

# Example 3

Step 1: Draw the graphs of both inequalities on the same Cartesian plane.

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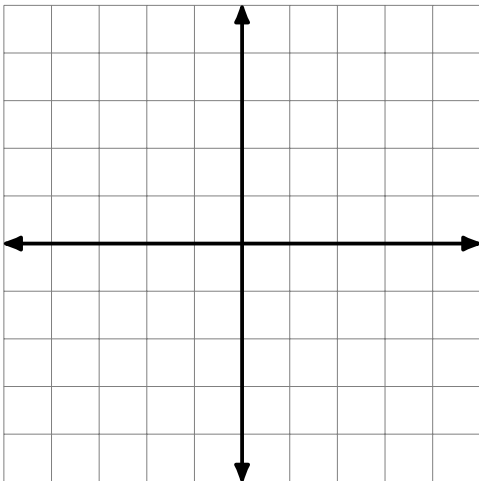
- ▶  $(0, 1)$  and  $(-2, 0)$  for  $x - 2y < -2$
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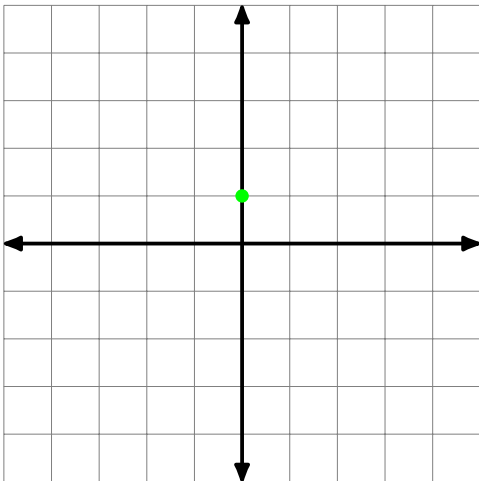


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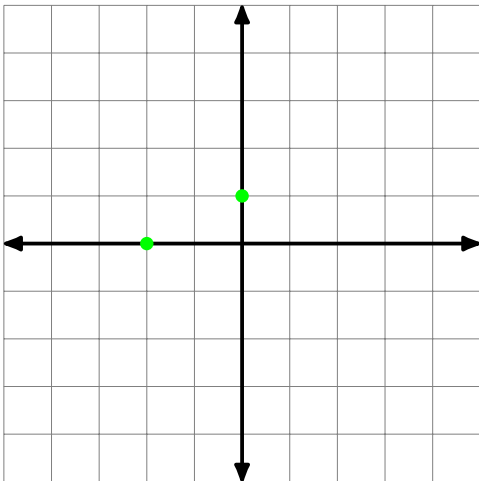


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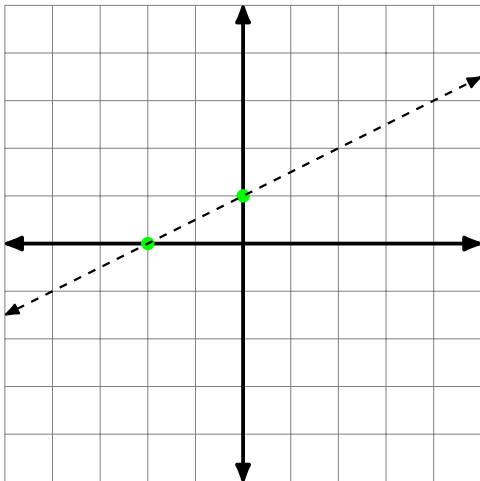


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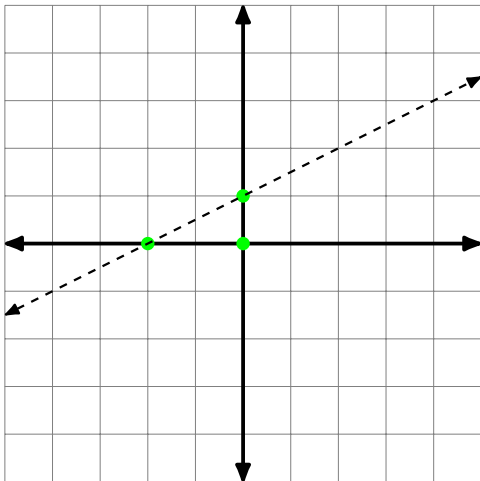


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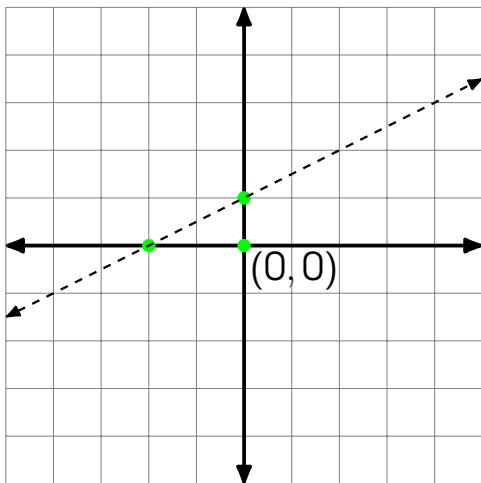


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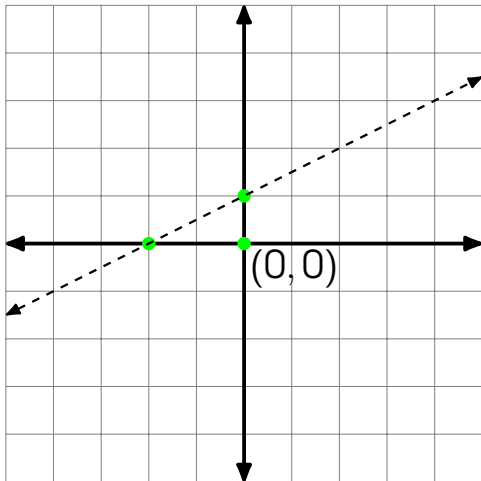


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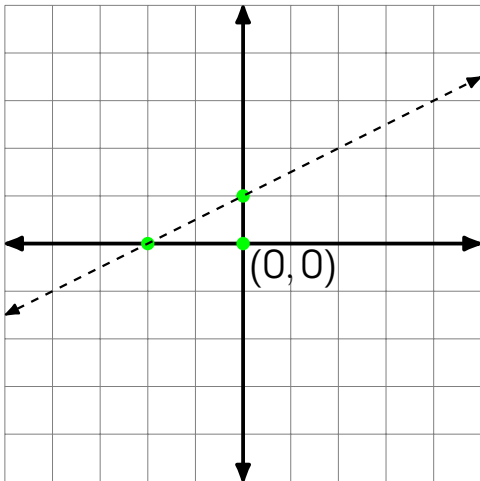
$$x - 2y < -2$$

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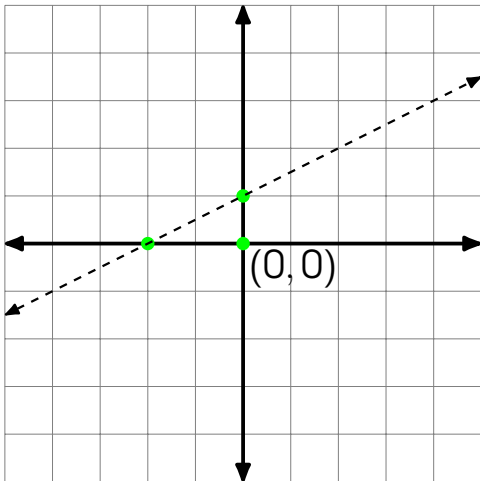
$$x - 2y < -2$$
$$0 - 2(0) < -2$$

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$$\begin{aligned}x - 2y &< -2 \\0 - 2(0) &< -2 \\0 - 0 &< -2\end{aligned}$$

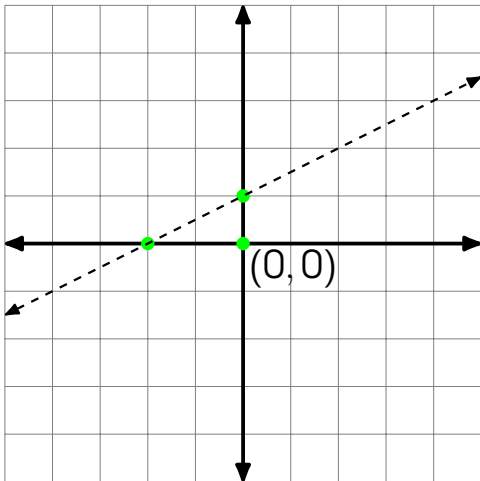


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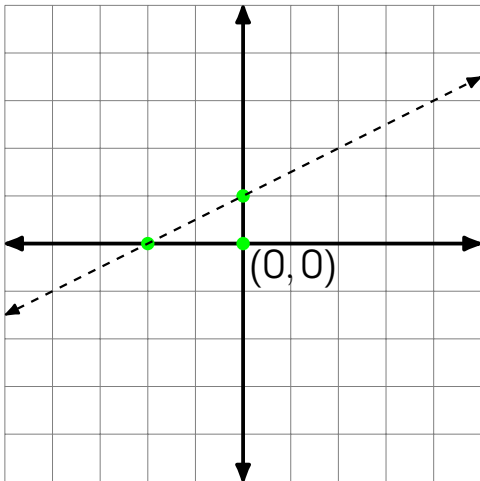
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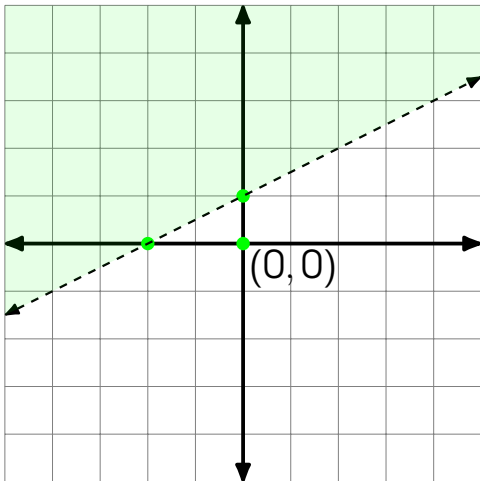
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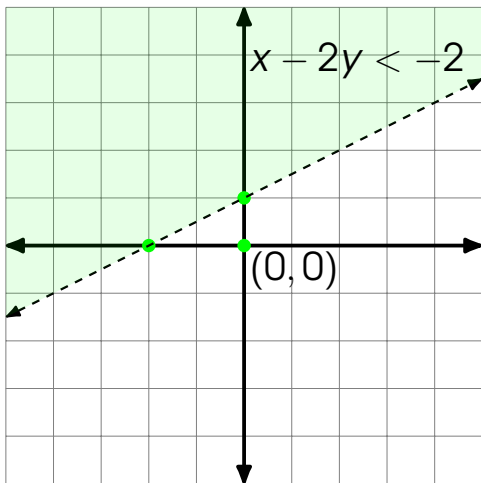
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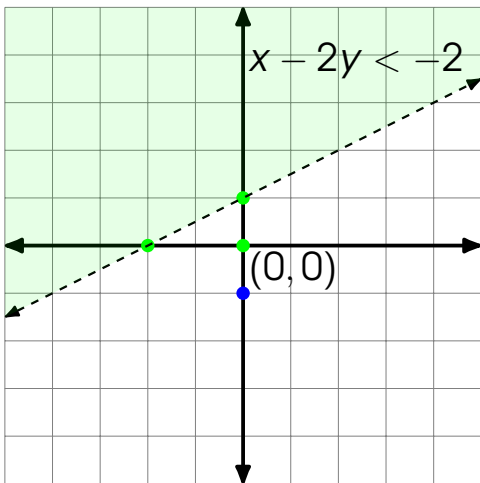


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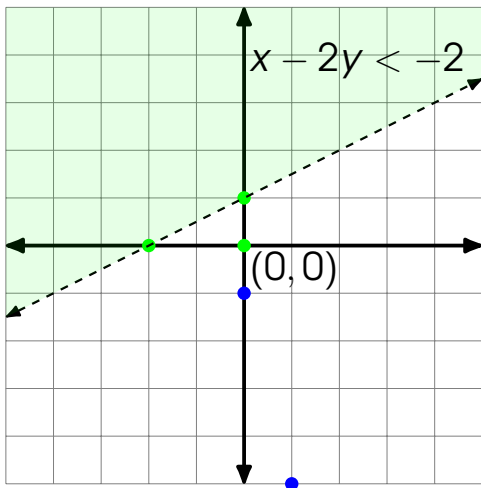


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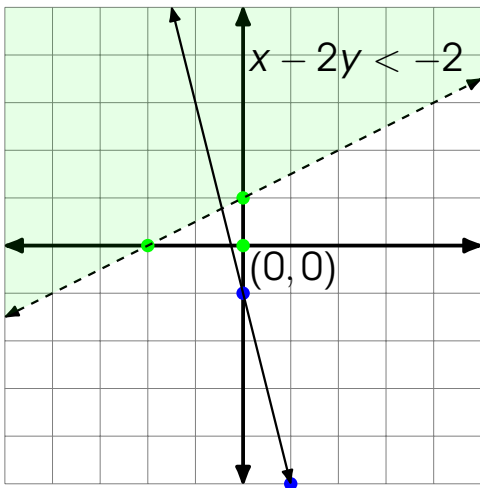


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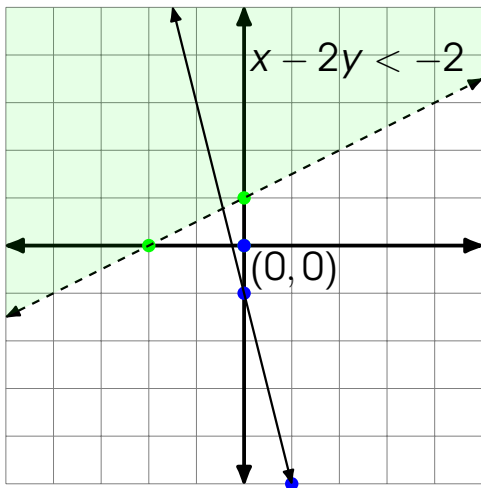


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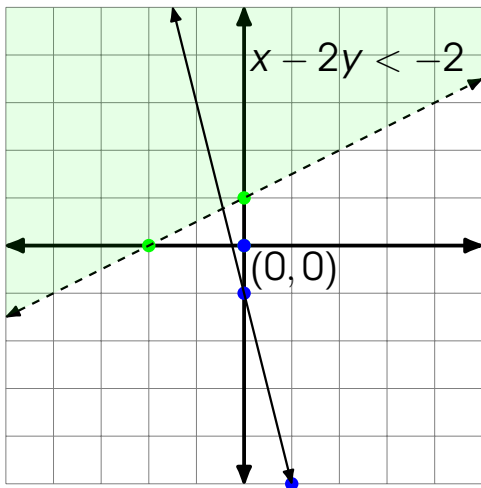


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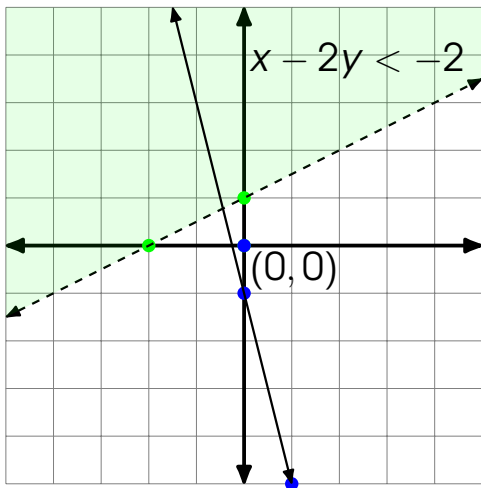
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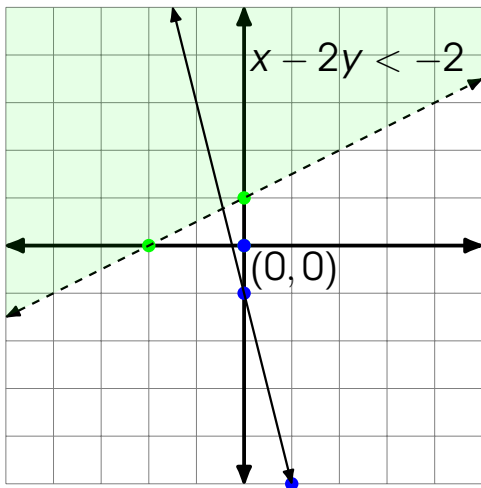
$$y \leq -4x - 1$$
$$0 \leq -4(0) - 1$$

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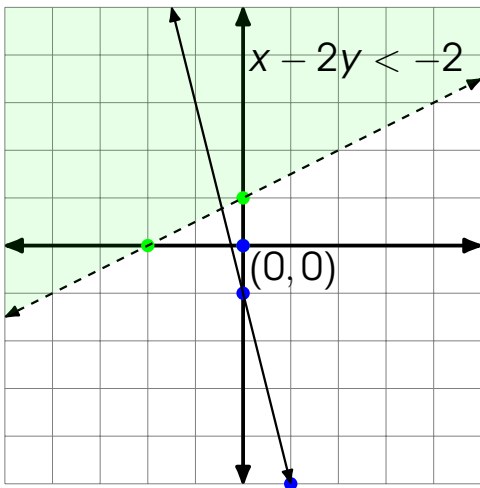
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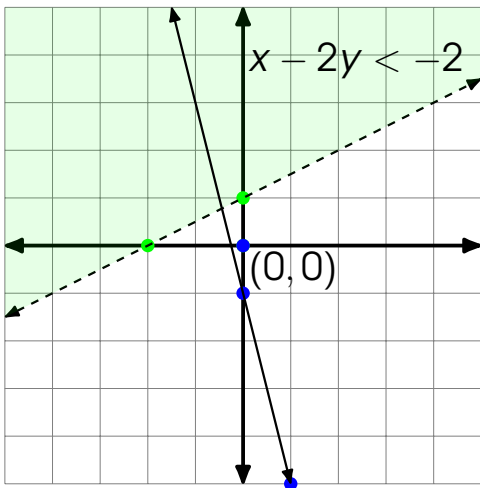
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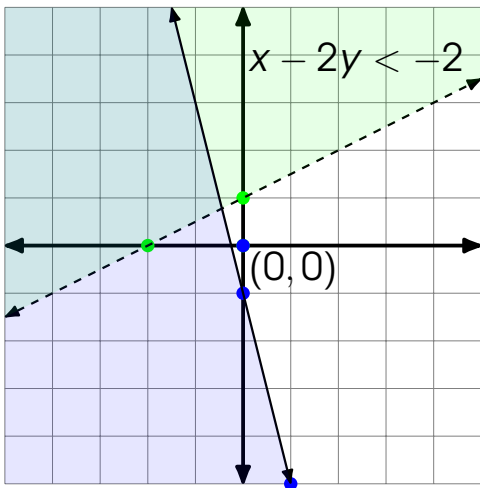
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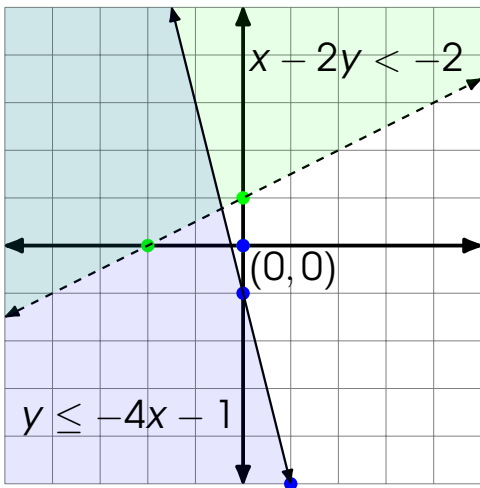
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Step 2: Determine the solution of the system by labeling the intersection region of all the solutions in the system.

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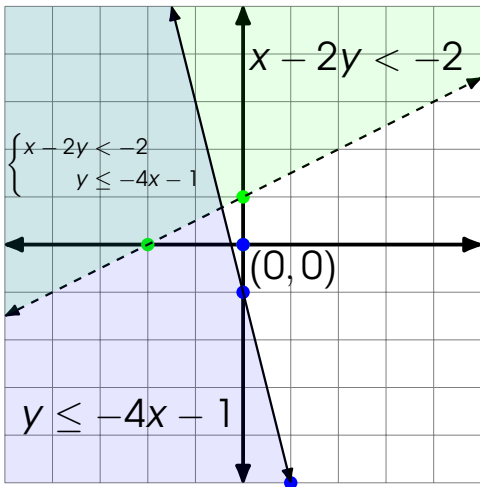


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**Thank you for watching.**