Graphing Linear Inequalities Notes

Inequalities are anything sign that does not mean "equal". Some examples of inequalities are:

$<$ "less than"

$>$ "greater than"

$\leq$ "less than or equal to"

$\geq$ "greater than or equal to"

When we are graphing linear inequalities, we graph them very similarly to how we graphed lines.

Example 1:

Graph: $2x + 3y > 6$

The first thing we need to do is solve for y.

$2x + 3y > 6$

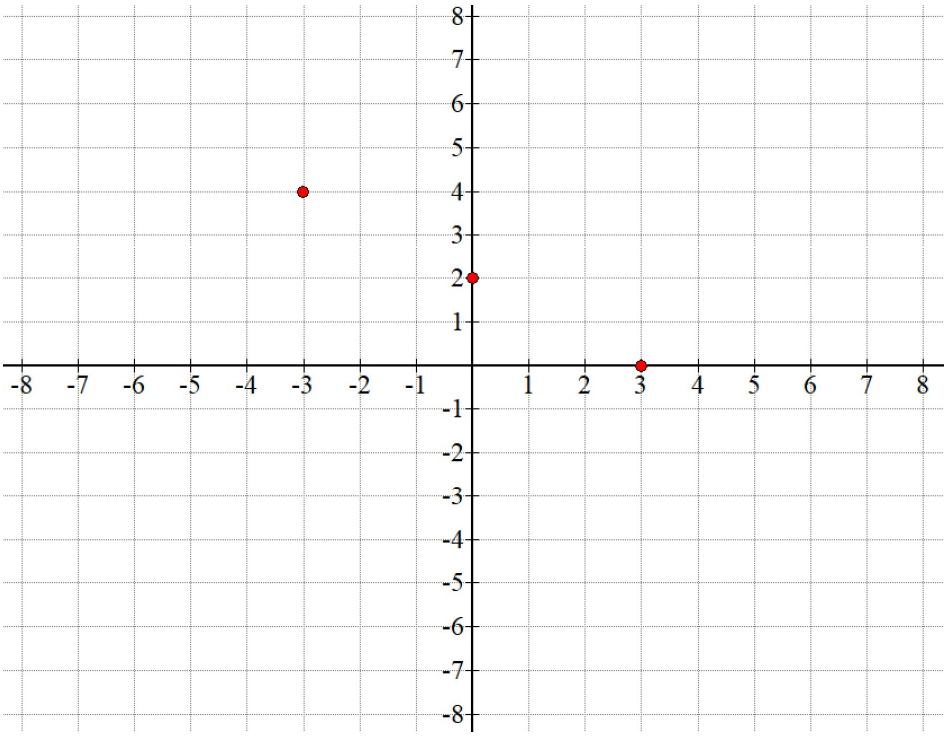
$-2x \qquad -2x$

$3y > -2x + 6$

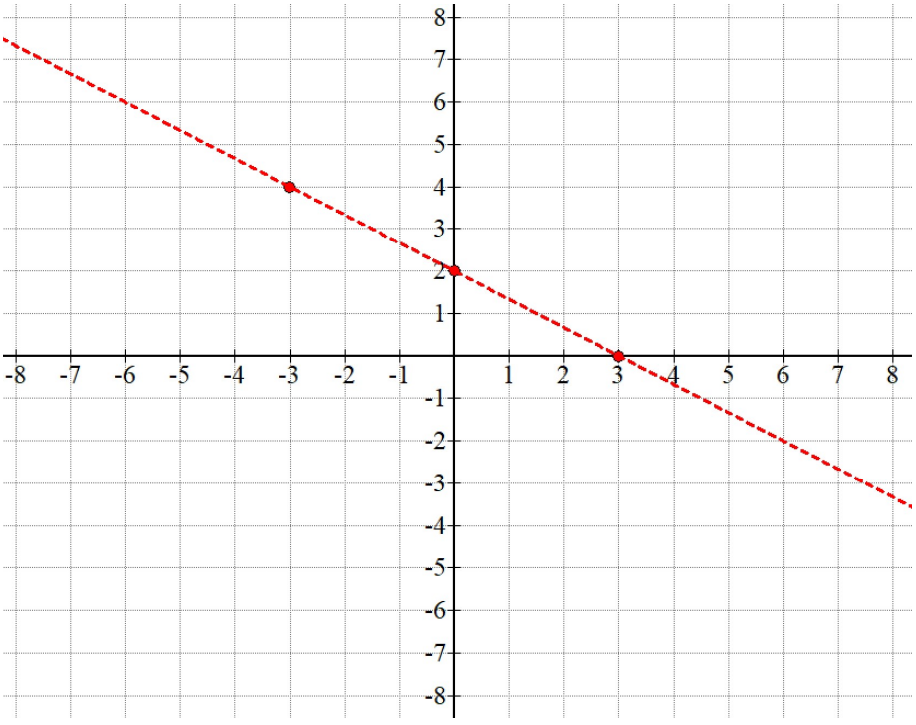
$\frac{3y}{3} > \frac{-2x}{3} + \frac{6}{3}$

$y > -\frac{2}{3}x + 2$

Now that we have y solved for we know our y-intercept is 2 and our slope is $-\frac{2}{3}$. So, let's use that information to place points on our graph.



When we connect our points on the graph, we need to consider the inequality. $y > -\frac{2}{3}x + 2$ is strictly greater than (not equal to) so we will connect our points with a dashed line to show that the line is not part of the solution.



The last step in graphing this linear inequality is that we need to shade the side of the plane that includes our solutions. $y > -\frac{2}{3}x + 2$ means that our solutions are where y is greater than the line graphed. Remember that y-values are one the vertical axis. So, we want to shade above the line since that's where y-values will be greater.

The solutions to the inequality are any ordered pair inside the shaded region.

Example 2:

Graph: $x + y \leq -4$

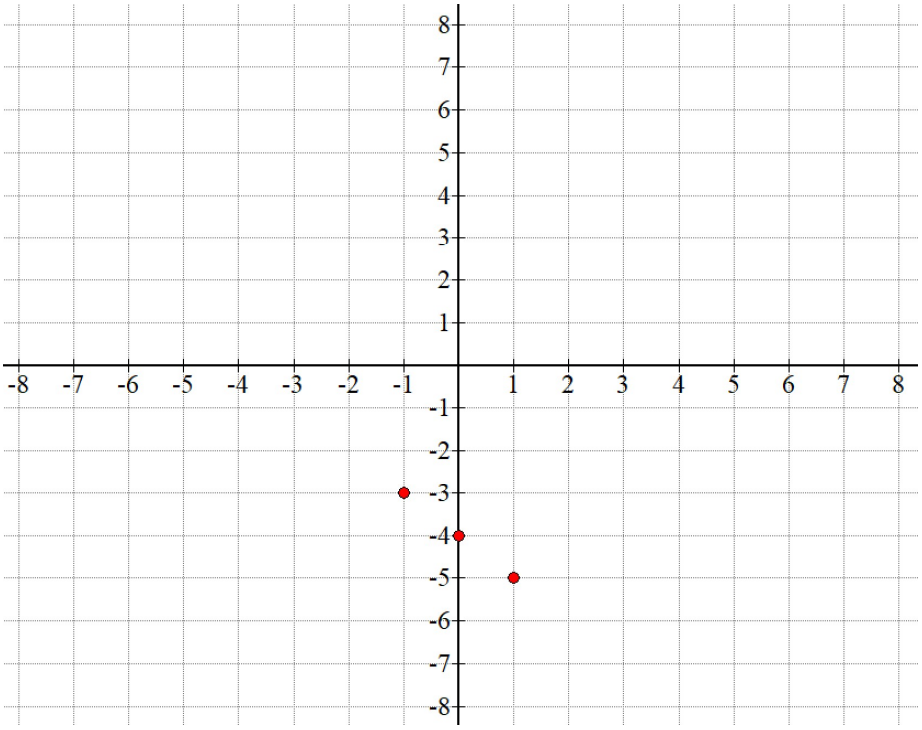
The first thing we need to do is solve for y.

$x + y \leq -4$

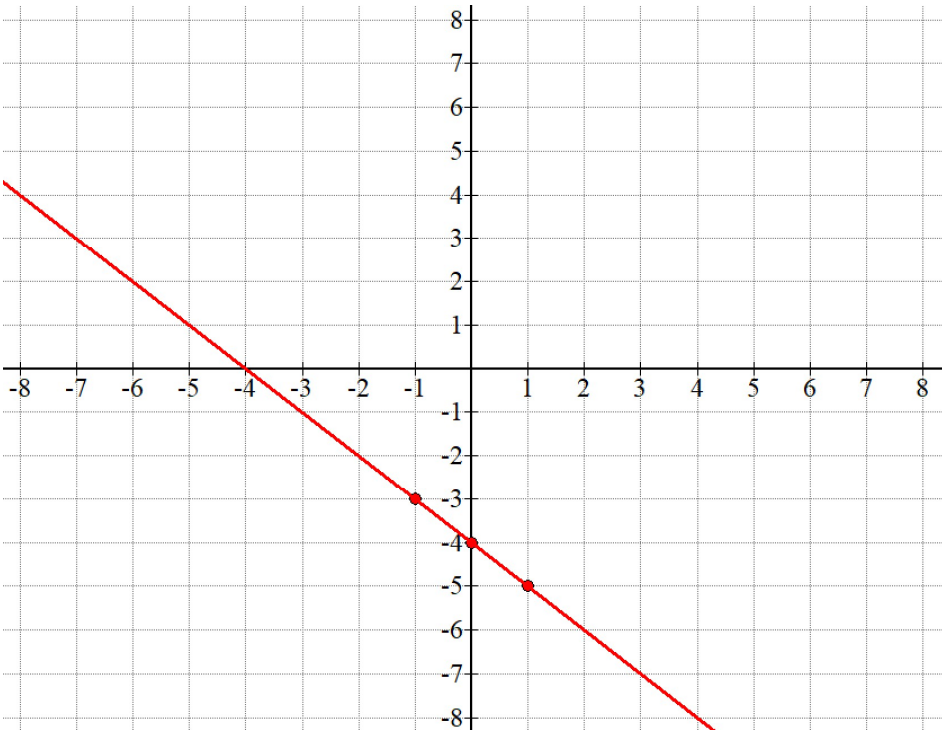
$-x \quad -x$

$y \leq -x - 4$

Now that we have y solved for we know our y-intercept is -4 and our slope is -1. So, let's use that information to place points on our graph.



When we connect our points on the graph, we need to consider the inequality. $y \leq -x - 4$ is less than or equal to so we will connect our points with a solid line to show that the line is part of the solution.



The last step in graphing this linear inequality is that we need to shade the side of the plane that includes our solutions. $y \leq -x - 4$ means that our solutions are where y is less than the line

graphed. Remember that y-values are one the vertical axis. So, we want to shade below the line since that's where y-values will be less.

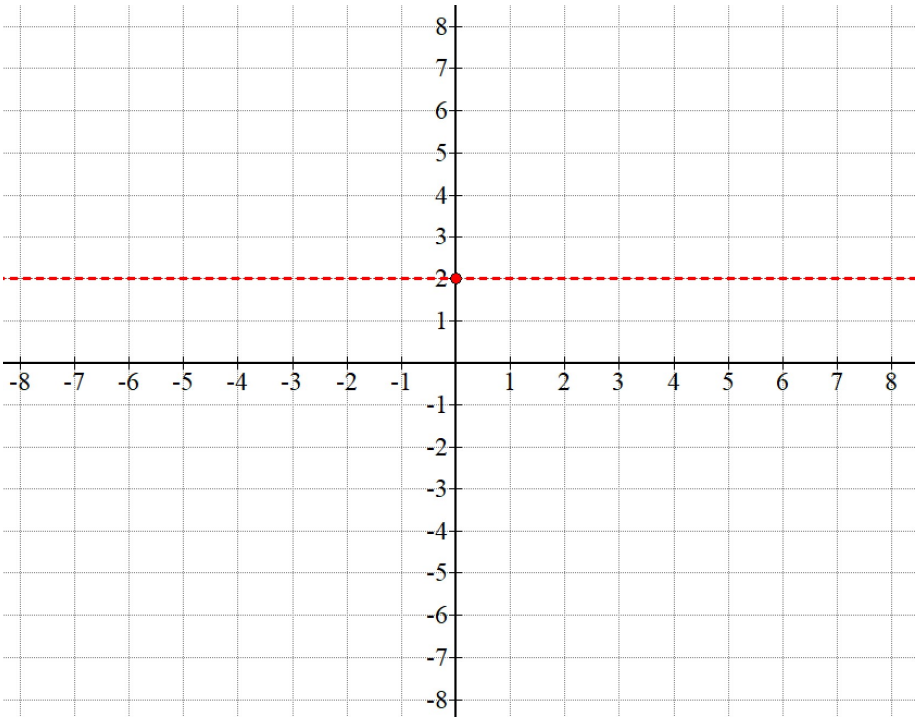
The solutions to the inequality are any ordered pair inside the shaded region.

Example 3:

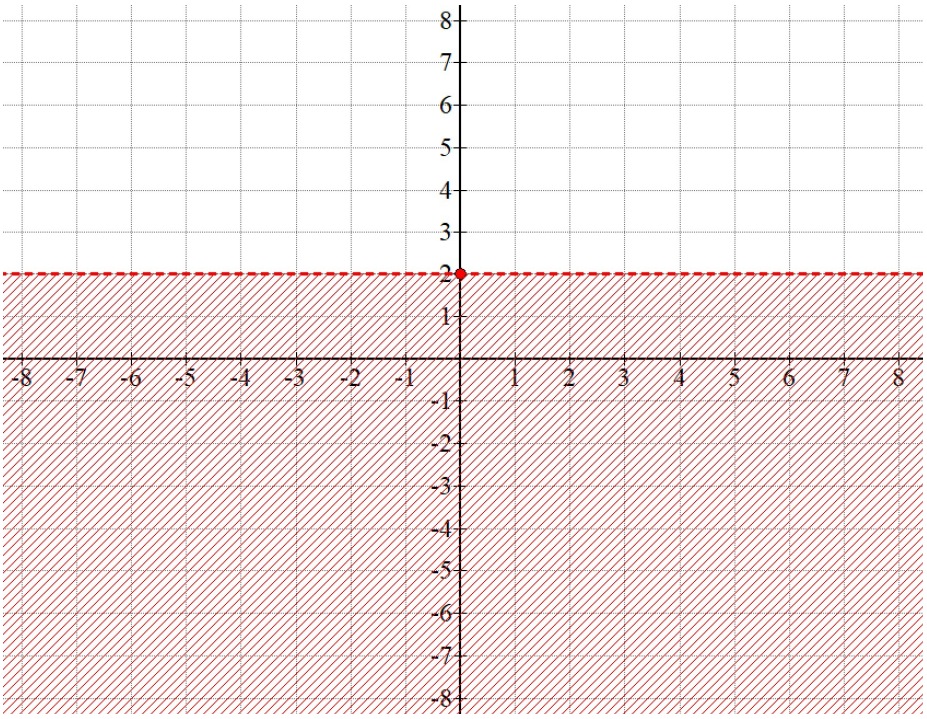
Graph: $y < 2$

We know that this is a horizontal line at 2 on the y-axis.

We will use a dashed line because the inequality is strictly less than (not equal to). This will show that the line is not part of the solution.



The last step in graphing this linear inequality is that we need to shade the side of the plane that includes our solutions. $y < 2$ means that our solutions are where y is less than the line graphed. Remember that y-values are one the vertical axis. So, we want to shade below the line since that's where y-values will be less.

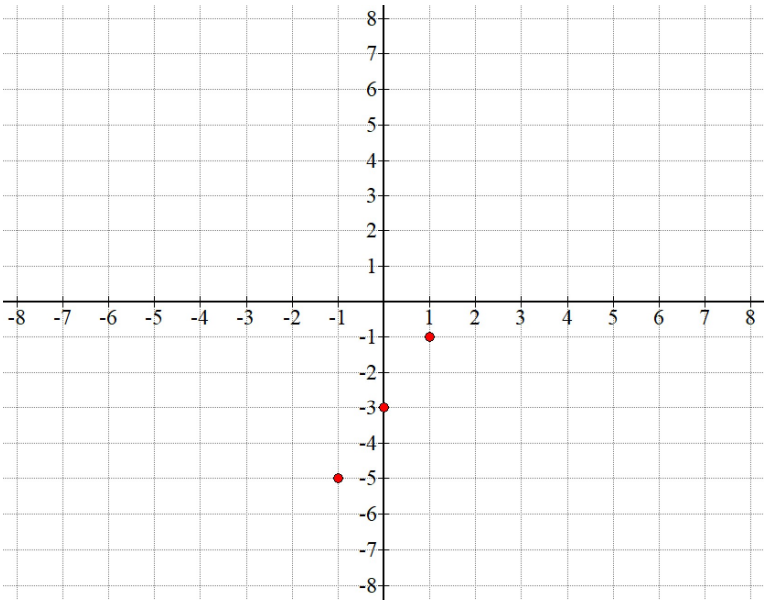


The solutions to the inequality are any ordered pair inside the shaded region.

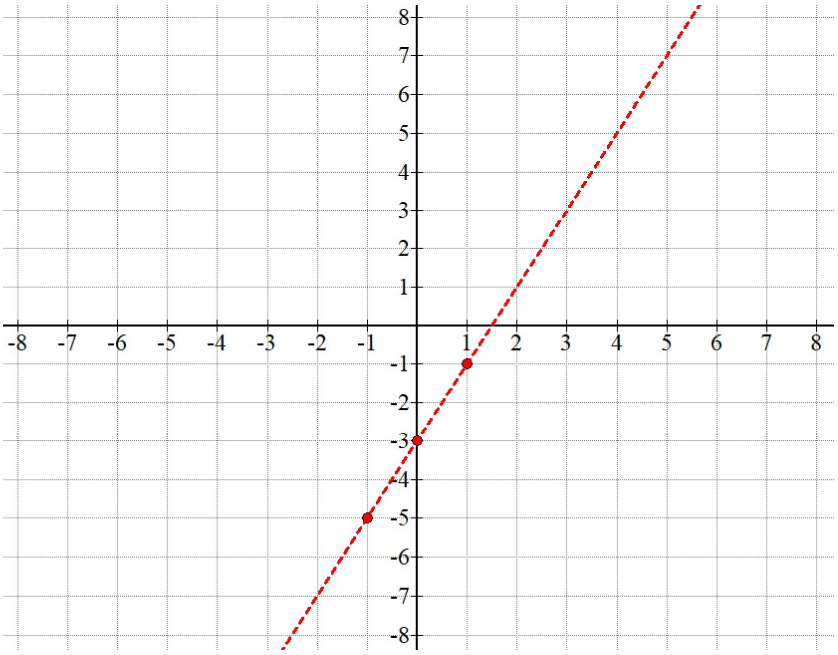
Example 4:

Graph: $y > 2x - 3$

Since y is solved for we know our y-intercept is -3 and our slope is $\frac{2}{1}$. So, let's use that information to place points on our graph.



When we connect our points on the graph, we need to consider the inequality. $y > 2x - 3$ is strictly greater than (not equal to) so we will connect our points with a dashed line to show that the line is not part of the solution.



The last step in graphing this linear inequality is that we need to shade the side of the plane that includes our solutions. $y > 2x - 3$ means that our solutions are where y is greater than the line graphed. Remember that y-values are one the vertical axis. So, we want to shade above the line since that's where y-values will be greater.

The solutions to the inequality are any ordered pair inside the shaded region.

<u>Example 5:</u>

Graph: $x - y \geq 0$

The first thing we need to do is solve for y.

$x - y \geq 0$

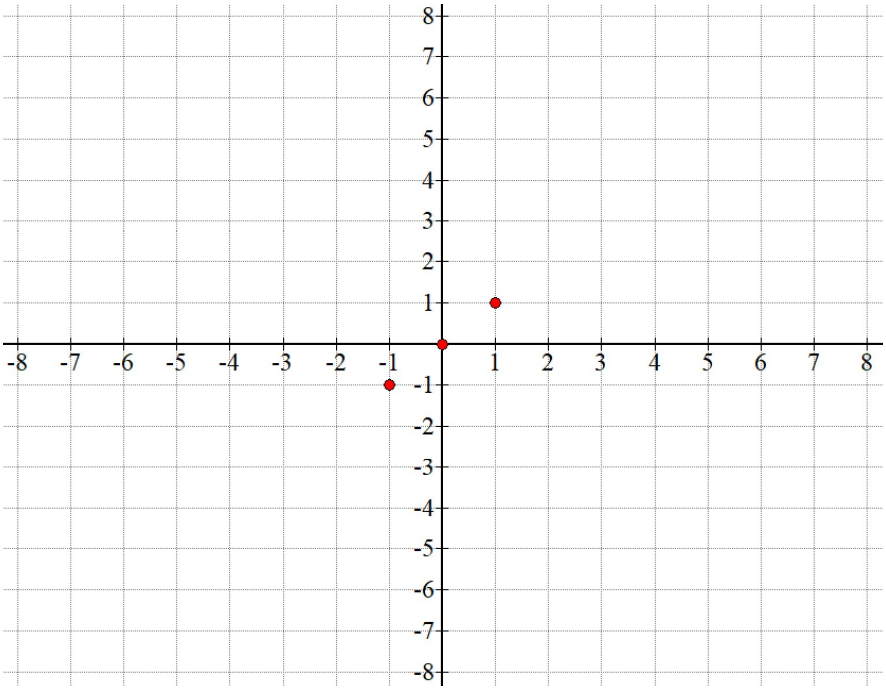
$-x \quad -x$

$-y \geq -x$

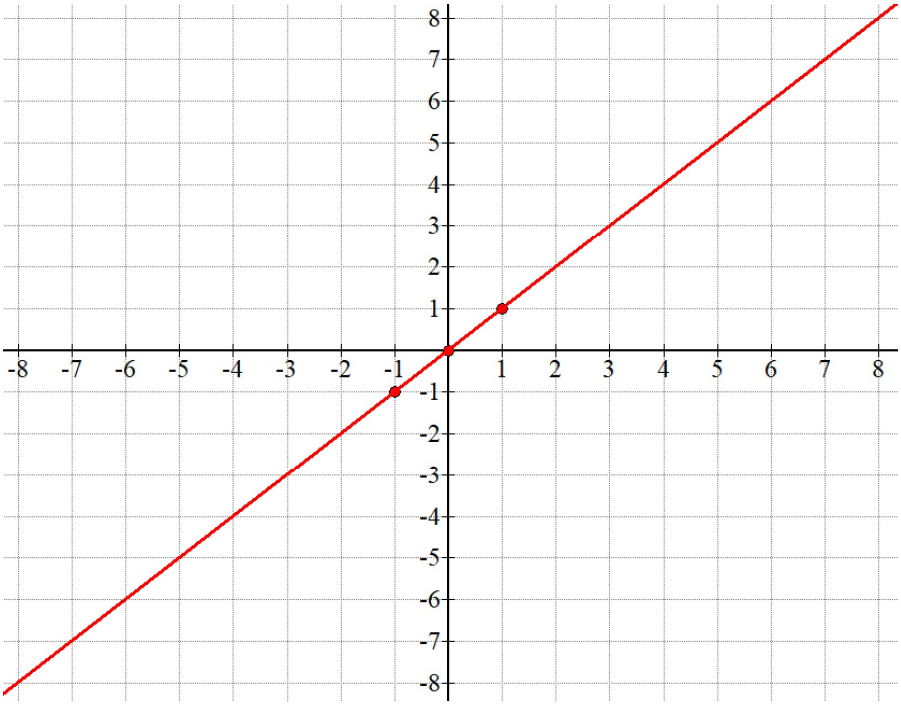
$\frac{-y}{-1} \geq \frac{-x}{-1}$

$y \leq x$ **Remember to flip the inequality if you multiply or divide by a negative number.

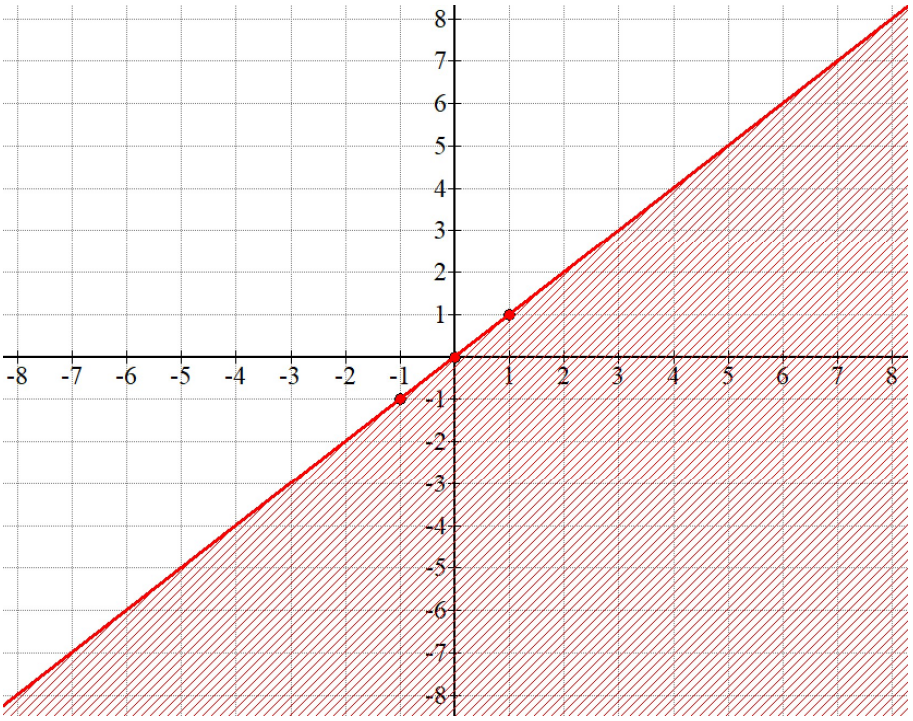
Now that we have y solved for we know our y-intercept is 0 and our slope is $\frac{1}{1}$. So, let's use that information to place points on our graph.



When we connect our points on the graph, we need to consider the inequality. $y \leq x$ is less than or equal to so we will connect our points with a solid line to show that the line is part of the solution.



The last step in graphing this linear inequality is that we need to shade the side of the plane that includes our solutions. $y \leq x$ means that our solutions are where y is less than the line graphed. Remember that y-values are one the vertical axis. So, we want to shade below the line since that's where y-values will be less.



The solutions to the inequality are any ordered pair inside the shaded region.

Example 6:

Graph: $x - 2y \leq 5$

The first thing we need to do is solve for y.

$x - 2y \leq 5$

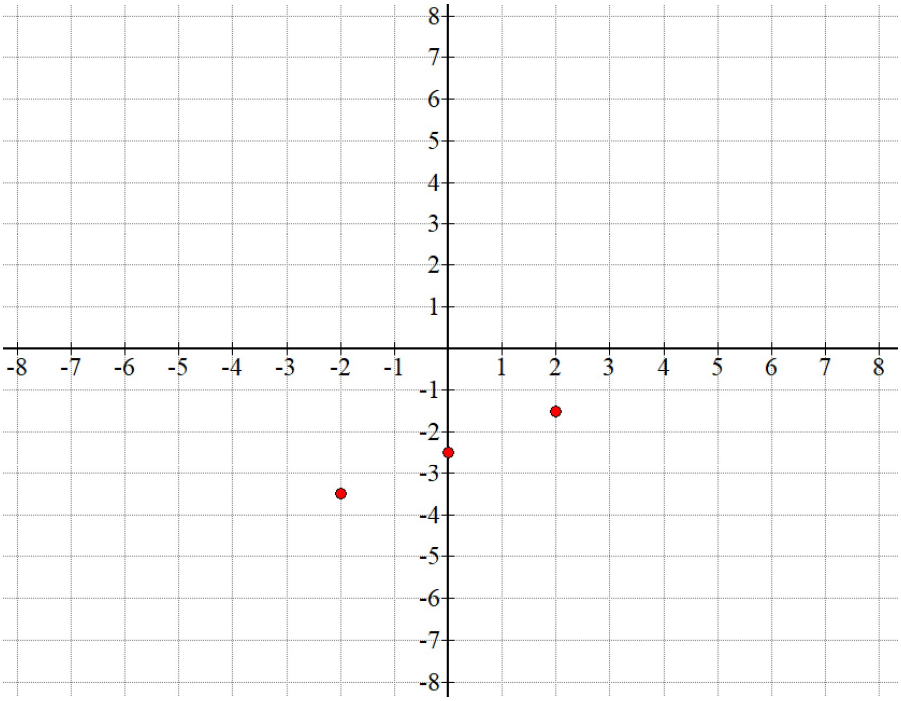
$-x \quad -x$

$-2y \leq -x + 5$

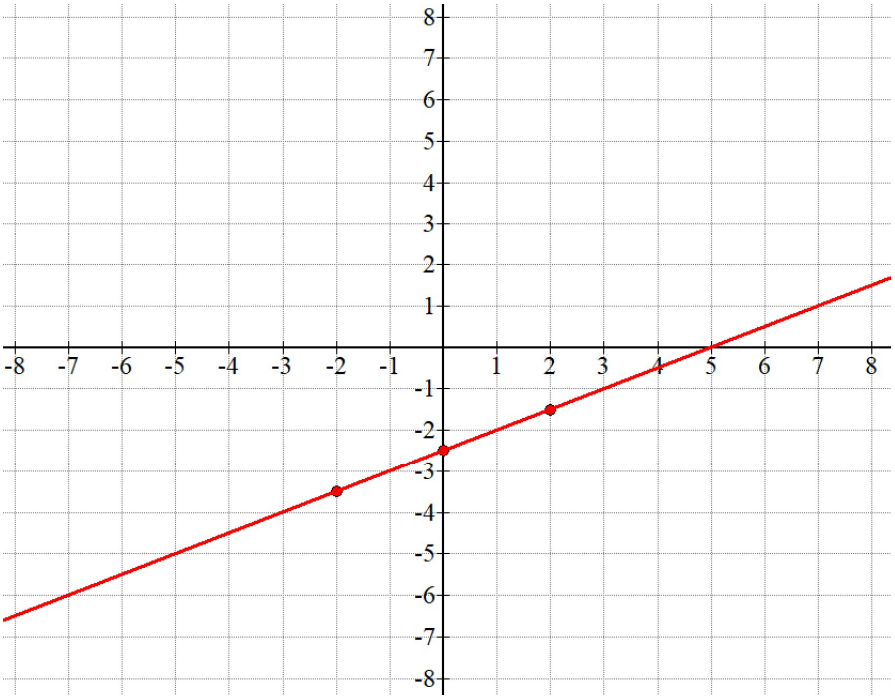
$\frac{-2y}{-2} \leq \frac{-x}{-2} + \frac{5}{-2}$

$y \geq \frac{1}{2}x - 2\frac{1}{2}$ **Remember to flip the inequality if you multiply or divide by a negative number.

Now that we have y solved for we know our y-intercept is $-2\frac{1}{2}$ and our slope is $\frac{1}{2}$. So, let's use that information to place points on our graph.



When we connect our points on the graph, we need to consider the inequality. $y \geq \frac{1}{2}x - 2\frac{1}{2}$ is greater than or equal to so we will connect our points with a solid line to show that the line is part of the solution.



The last step in graphing this linear inequality is that we need to shade the side of the plane that includes our solutions. $y \geq \frac{1}{2}x - 2\frac{1}{2}$ means that our solutions are where y is greater than the line graphed. Remember that y-values are one the vertical axis. So, we want to shade above the line since that's where y-values will be greater.

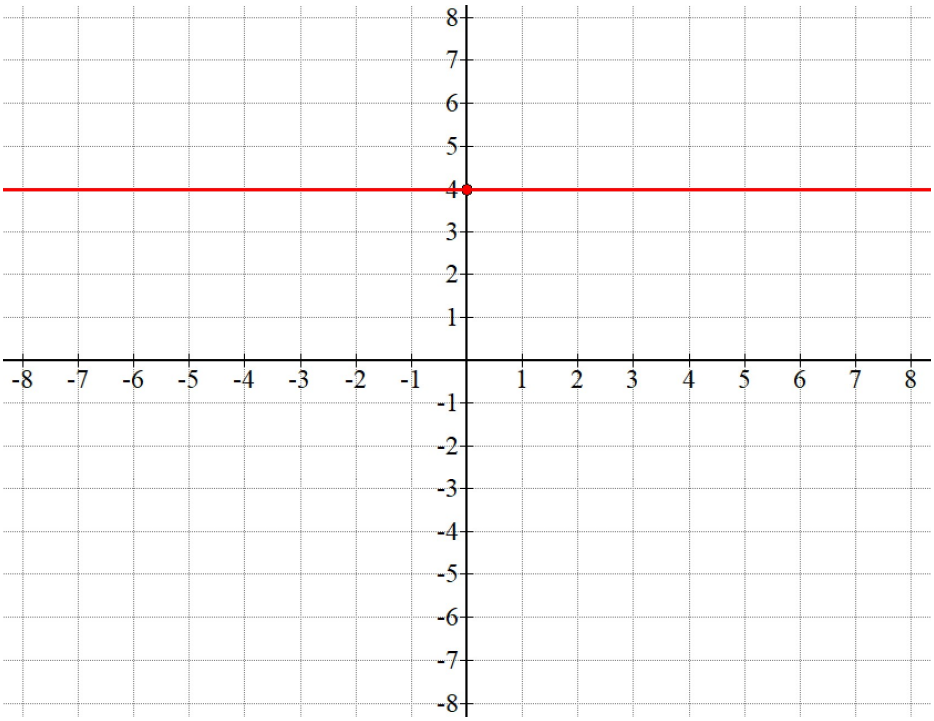
The solutions to the inequality are any ordered pair inside the shaded region.

Example 7:

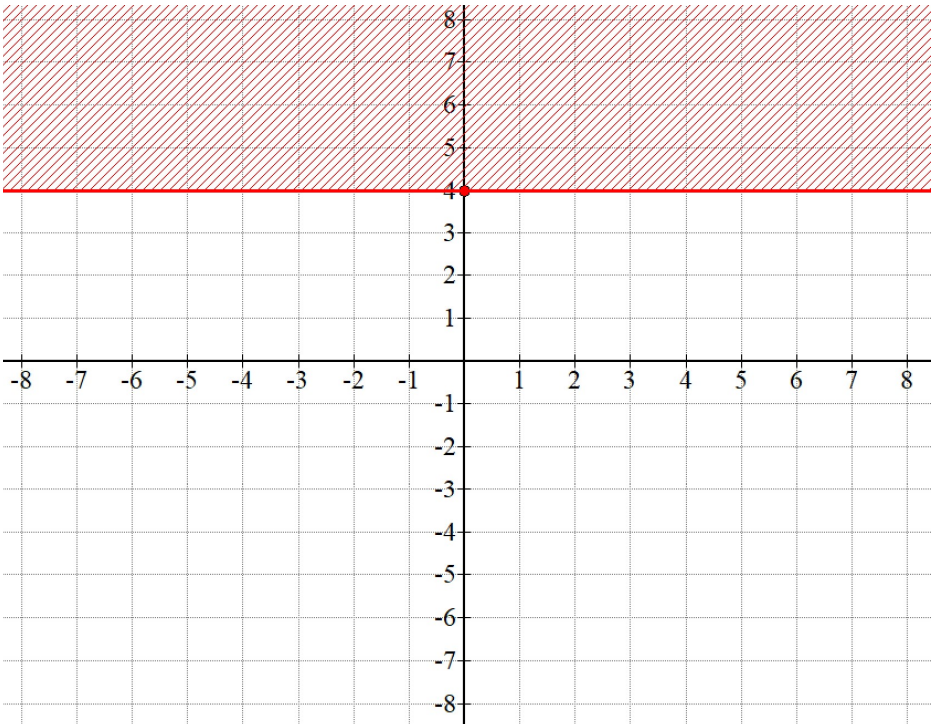
Graph: $y \geq 4$

We know that this is a horizontal line at 4 on the y-axis.

We will use a solid line because the inequality is greater than or equal to. This will show that the line is part of the solution.



The last step in graphing this linear inequality is that we need to shade the side of the plane that includes our solutions. . $y \geq 4$ means that our solutions are where y is greater than the line graphed. Remember that y-values are one the vertical axis. So, we want to shade above the line since that's where y-values will be greater.



The solutions to the inequality are any ordered pair inside the shaded region.

Example 8:

Graph: $1 - y > x$

The first thing we need to do is solve for y.

$1 - y > x$

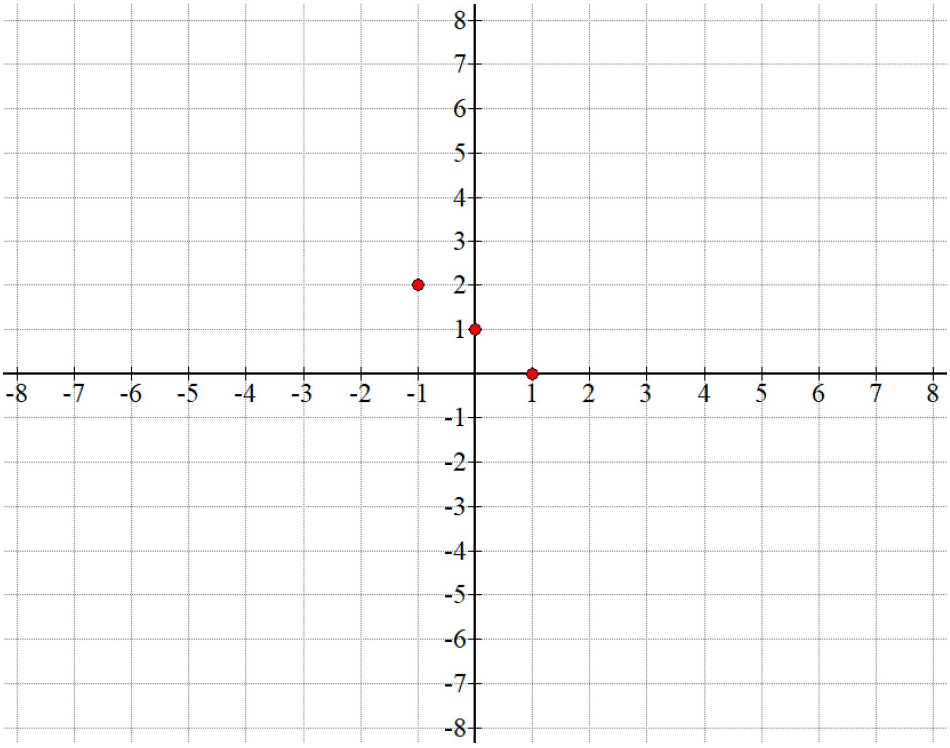
$-1 \quad -1$

$-y > x - 1$

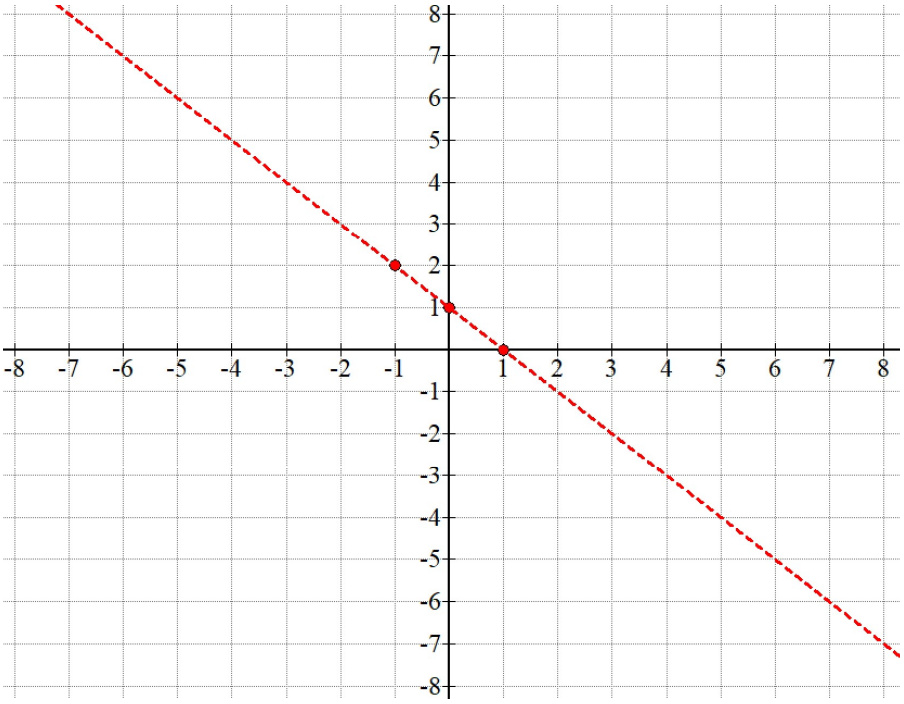
$\frac{-y}{-1} > \frac{x}{-1} - \frac{1}{-1}$

$y < -x + 1$ **Remember to flip the inequality if you multiply or divide by a negative number.

Now that we have y solved for we know our y-intercept is 1 and our slope is $-\frac{1}{1}$. So, let's use that information to place points on our graph.



When we connect our points on the graph, we need to consider the inequality. $y < -x + 1$ is strictly less than (not equal to) so we will connect our points with a dashed line to show that the line is not part of the solution.



The last step in graphing this linear inequality is that we need to shade the side of the plane that includes our solutions. . $y < -x + 1$ means that our solutions are where y is less than the line graphed. Remember that y-values are one the vertical axis. So, we want to shade below the line since that's where y-values will be less.

The solutions to the inequality are any ordered pair inside the shaded region.

Example 9:

Graph: $4 - 2x < -2$

Since there is no y variable, we should solve for x.

$4 - 2x < -2$

$-4 \qquad -4$

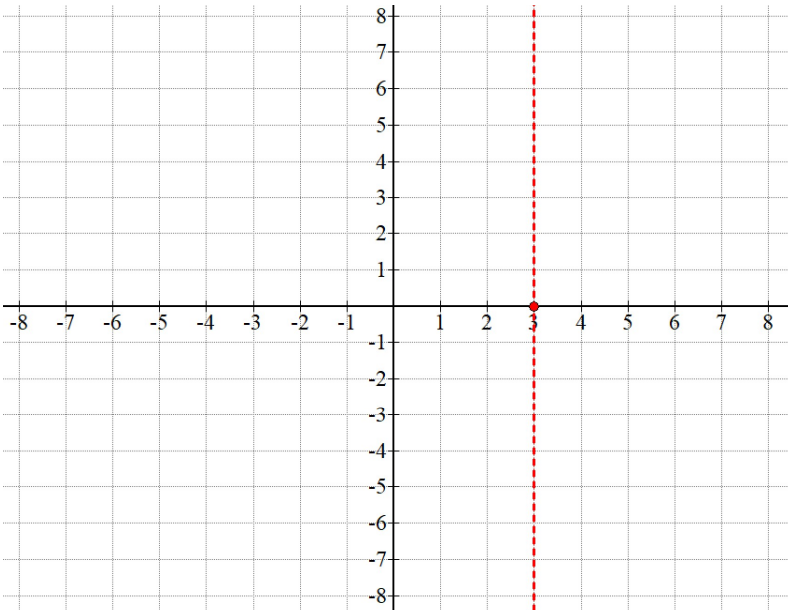
$-2x < -6$

$\frac{-2x}{-2} < \frac{-6}{-2}$

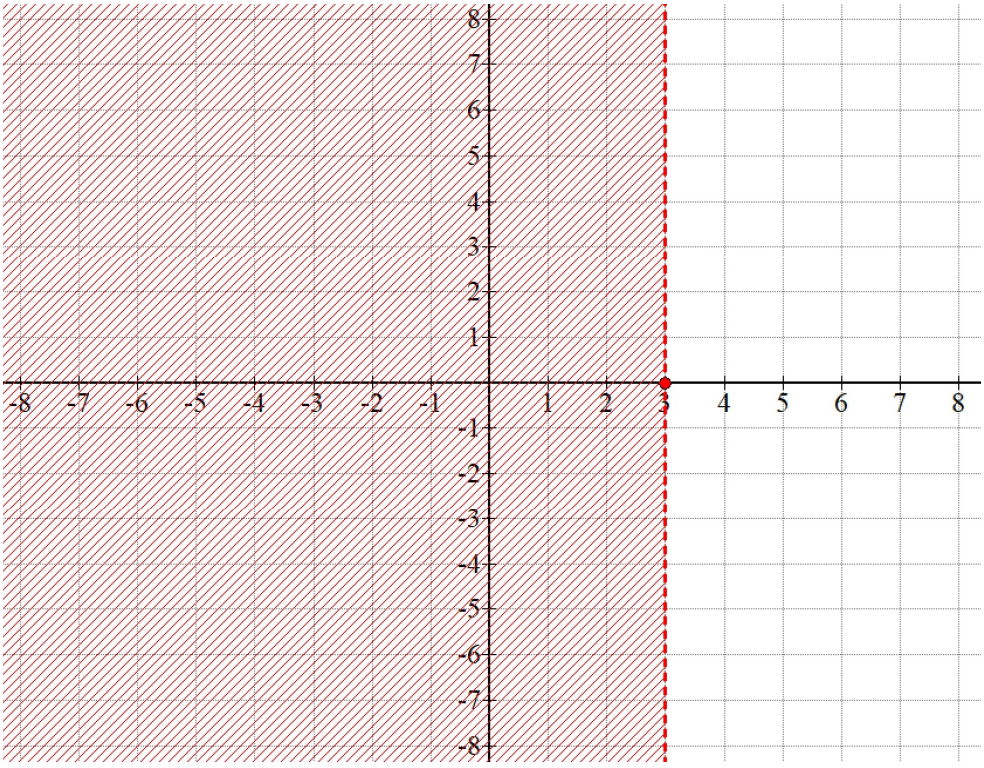
$x < 3$

We know that this is a vertical line at 3 on the x-axis.

We will use a dashed line because the inequality is strictly less than (not equal to). This will show that the line is not part of the solution.



The last step in graphing this linear inequality is that we need to shade the side of the plane that includes our solutions. $x < 3$ means that our solutions are where x is less than the line graphed. Remember that x-values are one the horizontal axis. So, we want to shade to the left of the line since that's where x-values will be less.



The solutions to the inequality are any ordered pair inside the shaded region.