Graphing Inequalities

Graphing inequalities is very similar to graphing equations with a few differences that we will get into as the lesson progresses.

This lesson will go over graphing inequalities in one variable, inequalities in two variables and systems of inequalities.

Graphing Inequalities in One Variable:

Inequalities in 1 variable refer to HORIZONTAL or VERTICAL inequalities.

To graph them, follow these steps:

1) Graph the inequality as if you were graphing an equation.

2) If the inequality sign is ≤ or ≥, the graphed inequality is a SOLID line. If the inequality signs < or >, the graphed inequality is a DASHED line.

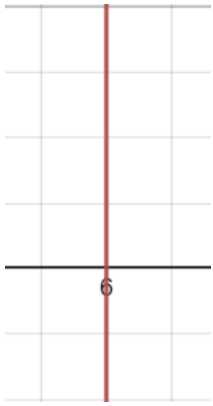
3) Use a TEST POINT on the coordinate grid to see what area of the graph should be shaded. Try to use (0,0) as a test point UNLESS the inequality goes through that point, in which case you will have to use a different test point.

Let’s practice and the process will become easier!

Graph $x \leq 6$ on a coordinate grid.

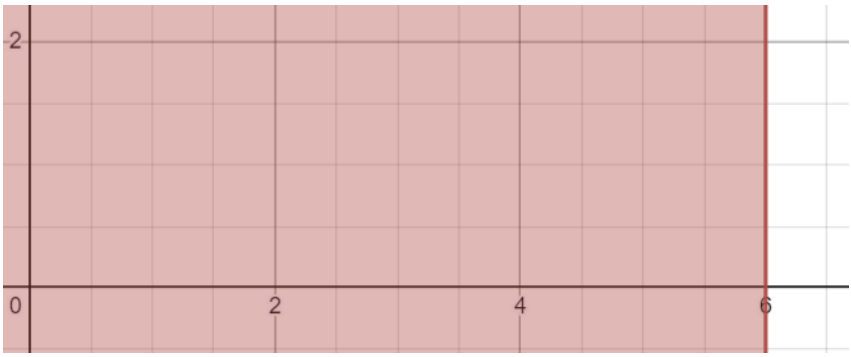
The first step is to pretend the line is an equation ($x = 6$) so it is easier to graph.

Remember that $x =$ a number lines are VERTICAL lines at that number, so graph a vertical line at the x-coordinate 6.



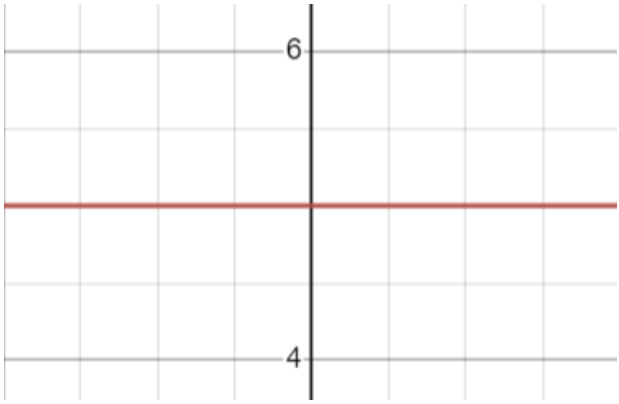
Since the inequality sign is ≤, the line remains SOLID.

Use the test point of (0, 0) to determine what side (LEFT or RIGHT of the line) we are shading. Since 0 is LESS THAN OR EQUAL TO (≤) 6, we shade the LEFT side of the line to INCLUDE (0,0).



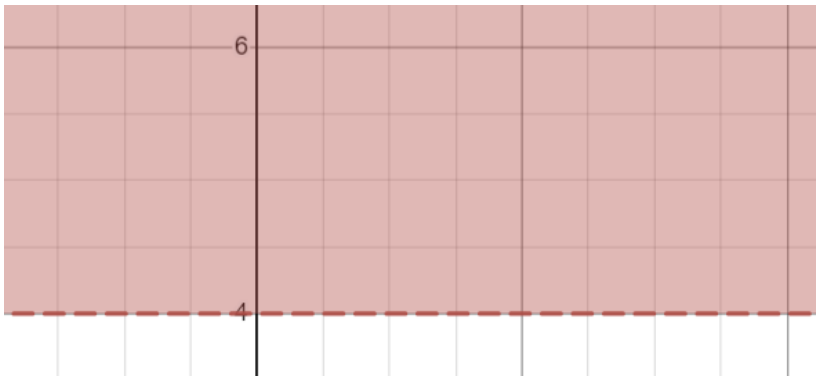
Graph y > 4 on a coordinate grid.

The first step is to graph y = 4, which is a HORIZONTAL line at the y-coordinate 4.



Since the inequality sign is >, the line will be DASHED.

Use the test point of (0,0) to figure out the side (TOP or BOTTOM) we are shading. Since 0 is LESS than 4, it does not satisfy this inequality, so we are shading the TOP portion above this Line (since (0,0) is not a solution).



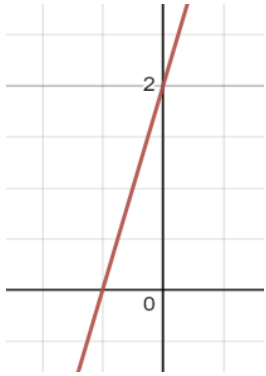
Graphing Inequalities in Two Variables:

Graphing inequalities in 2 variables refers to graphing a LINE in the form of an inequality.

To graph these inequalities, graph them as if they are a line in SLOPE-INTERCEPT form (y =mx + b) before following the same steps for determining whether the inequality is a solid line or dashed line and using a test point to figure out what area to shade.

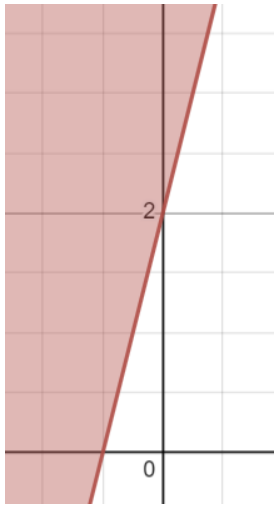
Graph $y \geq 4x + 2$ on a coordinate grid

The first step is to graph the equation $y = 4x + 2$, which has a SLOPE of 4 and a Y-INTERCEPT of 2.



Since the inequality sign is ≥, the line will remain SOLID.

Use the test point of (0,0) to determine what side (LEFT or RIGHT of the line) we are shading. Since (0,0) does NOT satisfy this inequality (0 is not greater than or equal to 2), shade the LEFT side that does not include (0,0).

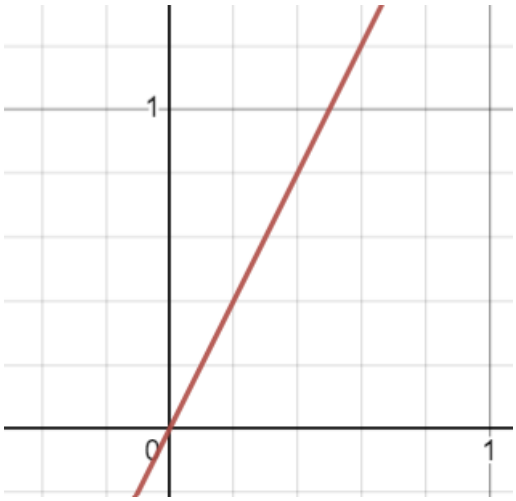


Graph $2y < 4x$ on a coordinate grid.

The first step is to pretend this is an equation ($2y = 4x$) and try to put it in SLOPE-INTERCEPT form.

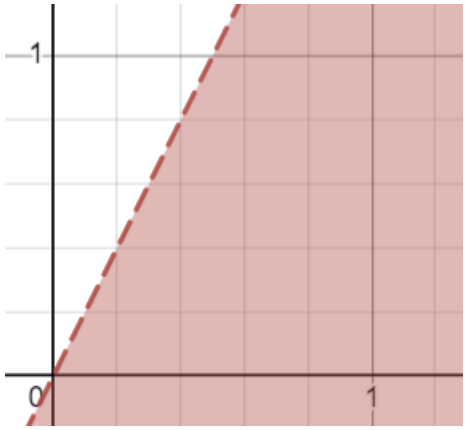
Divide both sides of the equation by 2 to get

$y = 2x$ (which you can change back to $y < 2x$).



Since the inequality sign is <, the line will become DASHED.

(0,0) is a point on y = 2x, so you CANNOT use it as a test point - Use (1, 0) instead. Since 0 is LESS than 2, we shade RIGHT of the line (to include (1, 0)).



Graphing Systems of Inequalities:

Graphing systems of inequalities refer to 2 inequalities that are BOTH in SLOPE-INTERCEPT form.

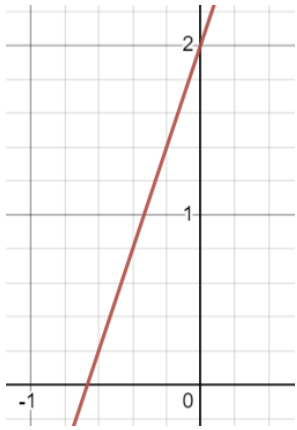
Graphing these inequalities follow the same steps as before, but our approach, to SHADING, will be different from before.

We will go through this process when doing this next problem:

Graph $y \geq 3x + 2$ and $y > x - 3$ on a coordinate grid.

To graph systems of inequalities (after writing both in SLOPE-INTERCEPT form), follow the same steps as before for the 1st equation before doing the 2nd equation.

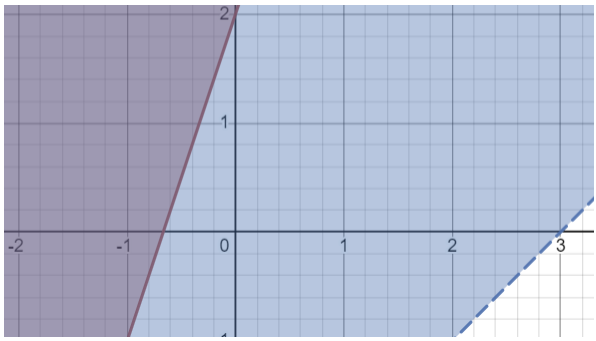
Start with $y \geq 3x + 2$. Graph $y = 3x + 2$ first, keeping the line SOLID (because of $\geq$).



In regards to shading, still use the test point of (0,0) to see what SIDE (LEFT or RIGHT) we are CONSIDERING to shade. Since 0 is NOT GREATER THAN or EQUAL to 2, we should FOCUS on the LEFT side (not including (0,0)).

DO NOT SHADE JUST YET! We need to follow the same steps for the 2nd inequality before shading.

After graphing y = x - 3, changing the line to DASHED and using (0, 0) as a test point (which works, so you are shading the LEFT side), you would get:

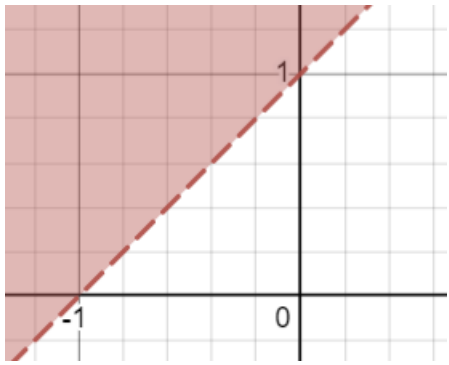


The DARKEST area (LEFT of (0, 0)) is the SOLUTION to this system (Both inequalities are SHADED in this area).

Sometimes you will need to write an inequality from its graph.

To do this, you should first identify the equation of the line before determining the inequality sign based on whether the line is SOLID or DASHED and then use the test point of (0, 0) to determine what DIRECTION the inequality sign points.

What inequality is represented in this graph?



The line goes through (-1, 0) and (0, 1). The change in y is 1 - 0 = 1 and the change in x is 0 – (-1) = 1. The slope is 1/1 = 1 and the y-intercept is 1, so the equation is y = x + 1.

Since the line is DASHED, the inequality sign is either < or >.

Since the test point of (0, 0) is NOT SHADED, it DOES NOT satisfy the inequality. As a result, the inequality is y > x + 1 because if you plug in (0, 0) to this inequality, you get 0 > 1, which is NOT TRUE.

Tips for Solving Problems:

1. Follow the same steps for graphing inequalities! Treat the inequality as an equation, so it is easier to graph. Then, keep the line SOLID if the inequality sign is ≤ or ≥ and DASHED if the inequality sign is < or >. Finally, use (0, 0) (or a point close to (0, 0) if (0, 0) is on the line) as a TEST POINT to determine what region you are shading for the solution to the inequality.

2. For systems of inequalities, follow the steps above until you get to shading for the 1st inequality. Find out what side you are shading, so after you follow the same steps from above for the 2nd inequality, you can see where the SHADING OVERLAPS. That area is the SOLUTION for both systems.

3. Remember for writing an inequality from a graph, start with writing the LINE in the graph before determining the INEQUALITY PAIR of signs (< > or ≤ ≥) depending on whether the line is DASHED/SOLID. Then, use the TEST POINT to see what DIRECTION the inequality sign points towards.