

Graphing Linear Inequalities

Graphing inequalities is similar to graphing equations except for a few minor differences

- If the graph consists of $>$ or $<$, the line is dotted
- If the graph consists of \geq or \leq , the line is solid
- The graph contains shading

The graphing of the actual lines for inequalities is the same when graphing equalities.

Using the Symbols to Decide Where to Shade

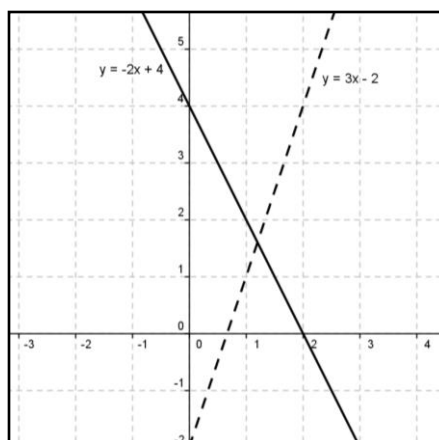
1. Make sure the line(s) is in one of the following forms
 - a. $y > mx + b$
 - b. $y \geq mx + b$
 - c. $y < mx + b$
 - d. $y \leq mx + b$
2. Graph the lines as equations ($y = mx + b$) but keep in mind if the line(s) need to be dotted or not.
3. Decide where to shade
 - a. If you have $y > mx + b$ or $y \geq mx + b$, then shade above the line.
 - b. If you have $y < mx + b$ or $y \leq mx + b$, then shade below the line.
4. When a problem asks for you to graph the solution set of a system of inequalities, start by going one line at a time. Graph the line and shade the correct side. Then repeat the process for the next line, until you have graphed and shaded for each of the lines given. Then look for the area that was shaded by all the inequalities. This area you will keep shaded. For the other sections that are only shaded by one of the inequalities you erase the shading.

Note: For vertical inequalities of the form



- a. $x > \#$ or $x \geq \#$, shade to the right
- b. $x < \#$ or $x \leq \#$, shade to the left

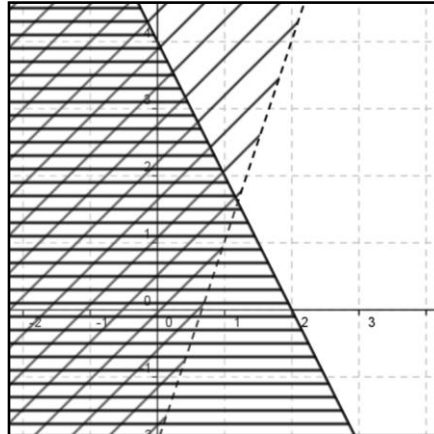
Example: Graph the solution set of $y < 3x - 2$
 $y \geq -2x + 4$



First we graph
 $y = 3x - 2$, this will have a dotted line
 $y = -2x + 4$, this will have a solid line

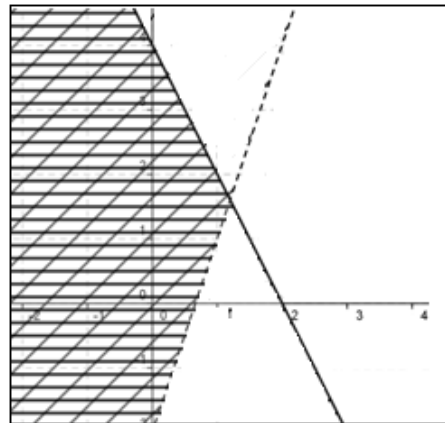


Now we need to start shading
 $y < 3x - 2$, we shade below
 $y \geq -2x + 4$, we shade above

We will use
 $y < 3x + 2$
 $y \geq -2x + 4$



Now we look for the area that has the
 double shade (the area that has both 
 and ) This is the area we will keep. All
 the other shading we will erase.
 We now have graphed the solution set.



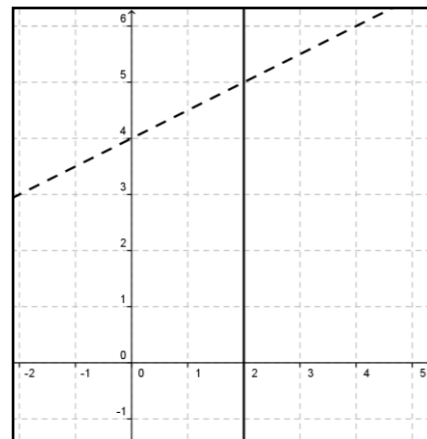
Using Test Points to Decide Where to Shade

Graphing with test points is helpful when you cannot remember what symbol means shade above or below. To use test points, we

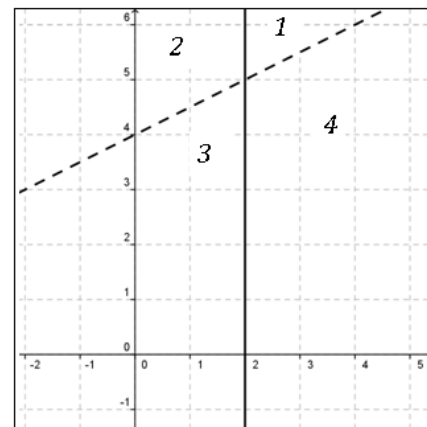
1. Graph the inequality(s) (the same way as above)
2. Pick a point in a region that is not on any line
3. Put that point into the inequality if the statement is true, shade the region that includes that point. If you have a system of inequalities, put the point into both inequalities. Both equations must be true for you to be able to shade.
4. Check other regions. These regions should make the inequality false.

Example: Graph the solution set of $y < \frac{1}{2}x + 4$
 $x \geq 2$

First we graph the lines
 $y = \frac{1}{2}x + 4$ as a dotted line
 $X = 2$ as solid line



From the graph, we can see that there are four regions, which we have labeled for demonstrative purposes.



We will start with region 3. It doesn't matter what region you start with. Picking the point (0,0), which is the easiest point if you can do it. Plugging the point into the inequalities we get

$$0 < \frac{1}{2}(0) + 4 \text{ or } 0 < 4 \text{ which is true}$$

$$0 \geq 2, \text{ which is false}$$

Since *both* statements are not true, we cannot shade.

Next we'll try region 1. We pick the point (3,6) and plug this information into our inequalities we get

$$6 < \frac{1}{2}(3) + 4 \text{ or } 6 < 5.5, \text{ which is false.}$$

$$3 > 2, \text{ which is true}$$

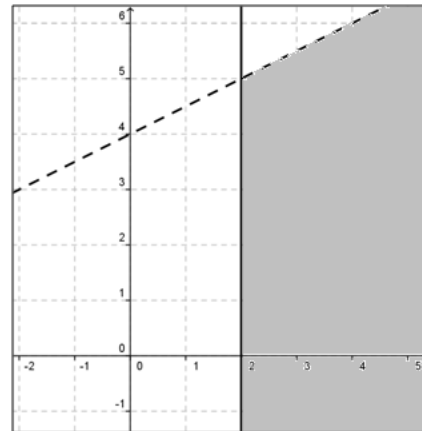
Since *both* statements are not true, we cannot shade.

Trying region 4, we choose the point (3,0) and plug this information into our inequalities we get

$$0 < \frac{1}{2}(3) + 4 \text{ or } 0 < 5.5, \text{ which is true}$$

$$3 \geq 2, \text{ which is true}$$

Since *both* statements are true, this is the region we will shade.



To check to make sure we have shaded the correct region, we will try a point from the remaining region, region 2. We choose the point (0,5) and plug this information into our inequalities we get

$$5 < \frac{1}{2}(0) + 4 \text{ or } 5 < 4 \text{ which is false}$$

$$0 \geq 2, \text{ which is false}$$

Since *both* statements are not true, we cannot shade.

We have graphed the solution set.

Helpful Websites

<http://www.purplemath.com/modules/ineqgrph.htm>

http://www.wtamu.edu/academic/anns/mps/math/mathlab/beg_algebra/beg_alg_tut24_ineq.htm

<http://www.onlinemathlearning.com/graphing-linear-inequalities.html>