
GRAPHING INEQUALITIES IN THE PLANE

□ *INEQUALITIES IN TWO VARIABLES*

Consider the following inequality in two variables:

$$y \leq 2x - 3$$

In English, it says that the value of y must be less than or equal to the quantity *3 less than twice the value of x* . To get a feel for this, let's test some x - y pairs. Then we'll discuss how to make a graph of the inequality.

Let's try the ordered pair $(5, -1)$; that is, $x = 5$ and $y = -1$:

$$y \leq 2x - 3$$

$$-1 \leq 2(5) - 3$$

$$-1 \leq 10 - 3$$

$$-1 \leq 7, \text{ which is } \underline{\text{true}}$$

Thus, the point **$(5, -1)$** WILL be on the graph of $y \leq 2x - 3$.

Now let's test the point $(0, 4)$:

$$y \leq 2x - 3$$

$$4 \leq 2(0) - 3$$

$$4 \leq 0 - 3$$

$$4 \leq -3, \text{ which is } \underline{\text{false}}$$

We conclude that **$(0, 4)$** will NOT be on the graph of $y \leq 2x - 3$.

Last, we we test the point (7, 11):

$$y \leq 2x - 3$$

$$11 \leq 2(7) - 3$$

$$11 \leq 14 - 3$$

$$11 \leq 11, \text{ which is } \underline{\text{true}}$$

Thus, the point (7, 11) WILL be on the graph of $y \leq 2x - 3$.

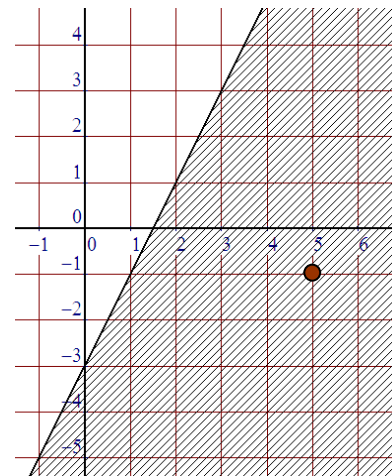
NOTE: The point (7, 11) is actually ON the line $y = 2x - 3$. This is why the inequality $11 \leq 11$ occurred at the last step.

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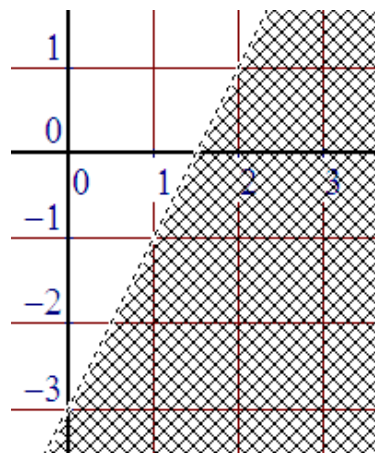
It's now time to graph the inequality $y \leq 2x - 3$.

Here's the process in a nutshell: Graph the line $y = 2x - 3$ (that is, ignore the inequality symbol for now). Then choose any point in the plane (that's not on the line) and test it against the inequality. If that point works, the graph of the inequality is the intirety of the side of the line containing the point; if the point does not work, the graph is the other side of the line.

Using the point (5, -1) that we showed before is a solution of the inequality, we shade the portion of the plane below the line. Notice that the line itself is graphed solid — this is because of the symbol “ $\leq$.”



If the inequality had been $y < 2x - 3$, then the graph would be the same except that we would *dash* the line and it would look something like this.



Homework

Graph each inequality:

1. $y \geq -2x + 3$

2. $y > 3x - 1$

3. $y \leq x$

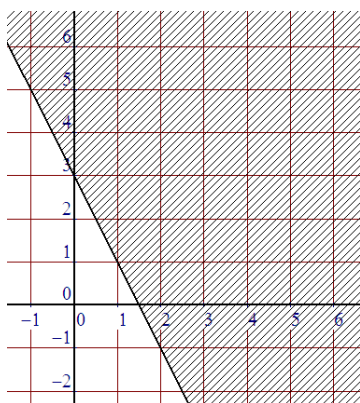
4. $y < -x - 2$

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

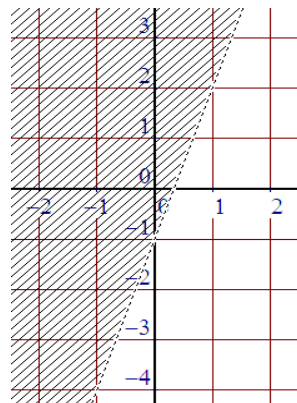
6. $-x + y \geq 4$

Solutions

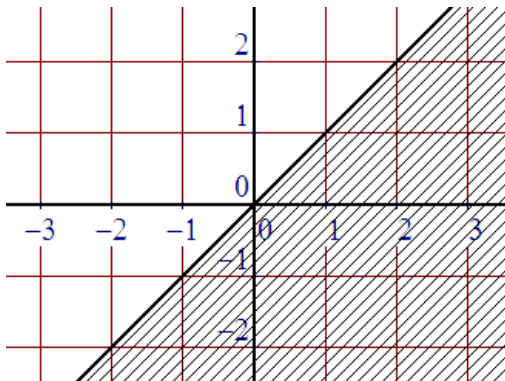
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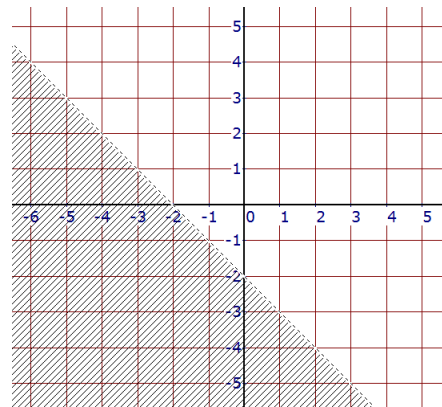
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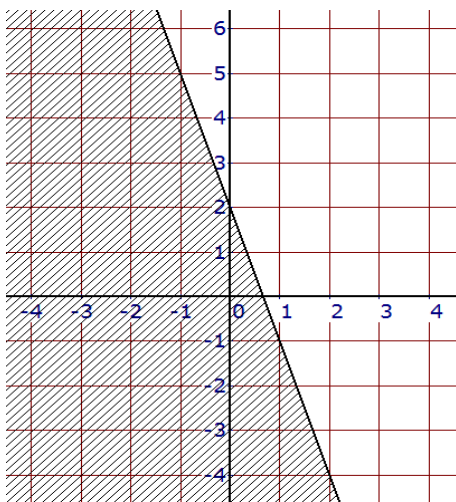
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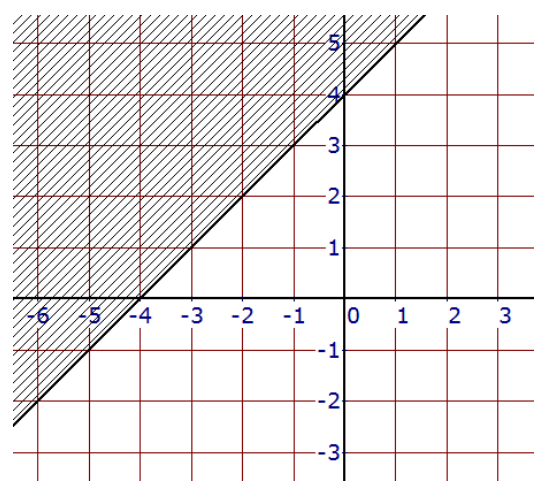
4.



5.



6.



Edith Hamilton:

“To be able to be caught up into the world of thought – that is educated.”