Section 2 – 4C: Graphing Linear Inequalities

Do I have to solve for y to graph the inequality if I can graph the Line without doing so.

In all the examples in lecture 4-6B each inequality was already solved for y. If the inequality has been solved for y then the less than symbol ($y < mx+b$) and the less than or equal to symbol ($y \leq mx+b$) tells you to shade **below the boundary line.** If the inequality has been solved for y then the greater than symbol ($y > mx+b$) and the greater than or equal to symbol ($y \geq mx+b$) tells you to shade **above the boundary line.**

If the inequality has NOT been solved for y then the greater than symbol and the less than symbol CANNOT be used to tell you to shade **above or below the the boundary line.** This is easy to see. In the examples where you solved for y and divided by a negative number the direction of the inequality symbol changed so the new inequality did not have the same direction as the original direction for the inequality.

Do I have to solve for y to graph the inequality if I can graph the Line without doing so.

NO

Step 1: Graph the boundary for the shade as a solid or dashed line.

A. Find the x and y intercepts (0, __) and (__ ,0) and use them to graph the line.

OR

B. Find the x and y coordinates of any two points and use them to graph the line.

Step 2: Find out if the shaded area should be above or below the boundary line.

A. Pick any point not on the boundary line and plug it into the inequality to see if it makes the inequality true.

B. If the selected point **makes the inequality true** then it is a solution and all the points on the **SAME SIDE** of the line as the point is are also solutions. Shade the area on that side of the line.

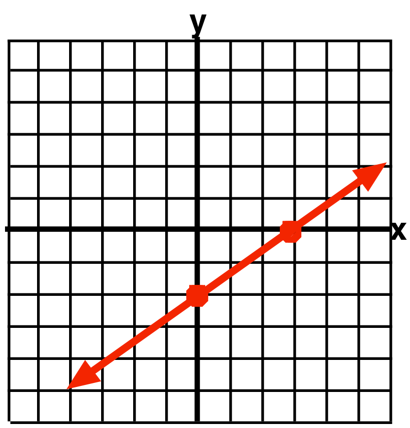
or

C. If the selected point **DOES NOT make the inequality true** then it is **NOT** a solution and all the points on the same side as the point are also NOT solutions. Shade the area on the **OTHER SIDE** of the line.

Example 1: Graph $2x - 3y \le 6$

Step 1

Graph a solid line at $2x - 3y = 6$ by using the y intercept (0, –2) and the x intercept (3, 0)

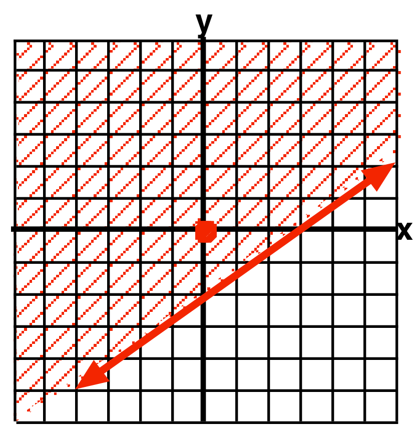


Step 2

Pick any (x ,y) point not on the line and plug it into $2x - 3y \le 6$ to see if it works. Selecting the point (0 , 0) results in

$$2x - 3y \le 6$$
$$2(0) - 3(0) \le 6$$
$$0 \le 6$$

which is **TRUE** so **(0 , 0) is a solution** and **ALL the shaded points** on the **same side** of the line that (0 , 0) is on are **ALSO solutions**.

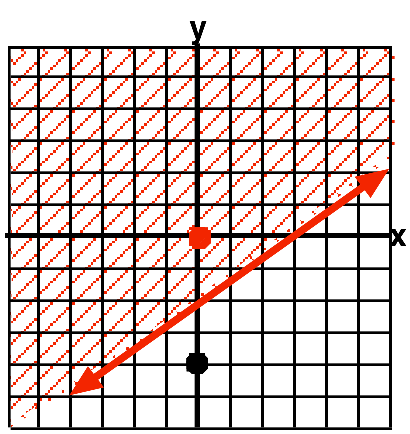


Check the points on the other side of the line to see that they DO NOT WORK

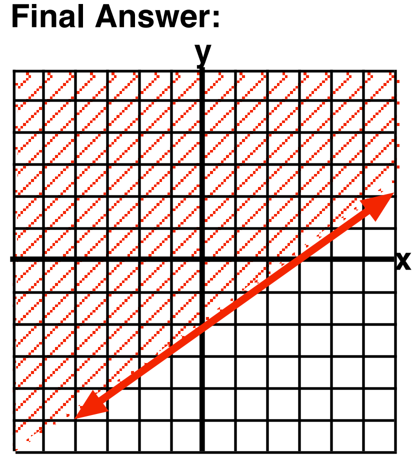
Pick an(x ,y) point on the unshaded side and plug it into $2x - 3y \le 6$ to check and see that it DOES NOT WORK. Using the point (0 , –4) results in

$$2x - 3y \le 6$$
$$2(0) - 3(-4) \le 6$$
$$12 \le 6$$

which is **False** so (0 , – 4) is **NOT** a solution and **NONE** of the points on the same side of the line that (0 , –4) is on are solutions.



Final Answer:

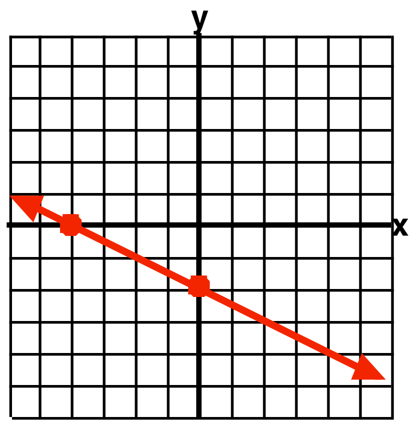


Example 2

graph $x + 2y \le -4$

Step 1

Graph a solid line at $x + 2y = -4$ **by using the y intercept (0, –2) and the x intercept (3, 0)**

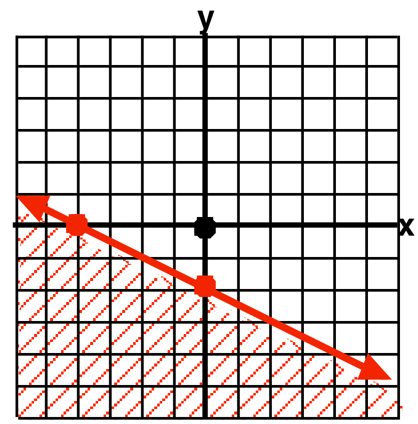


Step 2

Pick any (x ,y) point not on the line and plus it into $x + 2y \le -4$ **to see if it works. Selecting the point (0 , 0) results in**

$$0 + 2(0) \le -4$$
$$0 \le -4$$

which is **FALSE** so **(0,0) is NOT a solution** and **ALL the points** on the **same side** of the line that (0 , 0) is on are **also NOT solutions**. So **ALL the POINTS on the other side of the line** that **(0,0) is on ARE Solutions**

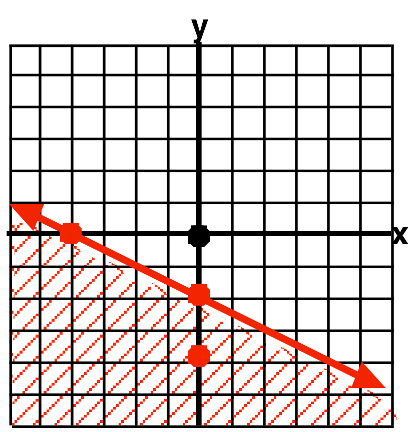


Check the points on the other side of the line FORM (0 , 0) to see that they DO WORK

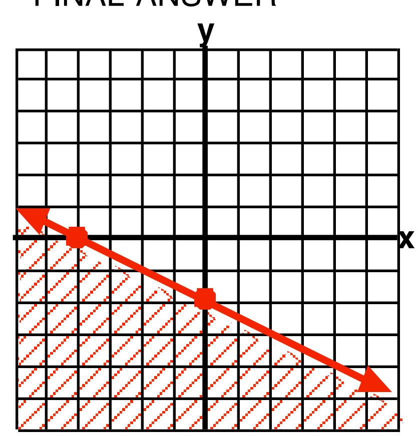
Pick an(x ,y) point on the shaded side and plug it into $x + 2y \le -4$ **to check and see that it DOES WORK. Selecting the point (0 , –4) results in**

$$0 + 2(-4) \le -4$$
$$-8 \le -4$$

which is **True** so (0 , – 4) **IS A SOLUTION** and **ALL** of the points on the same side of the line that (0 , –4) is on are also solutions.



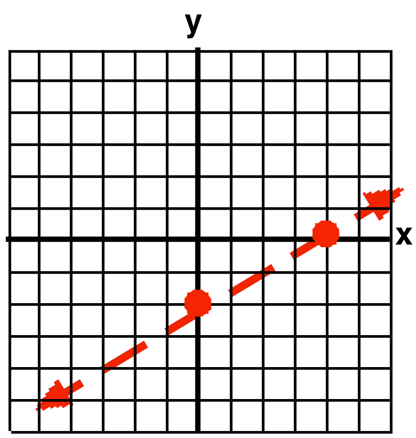
FINAL ANSWER



Example 3: Graph $x - 2y \le 4$

Step 1

Graph a dashed line at $x - 2y \le 4$ by using the y intercept (0, –2) and the x intercept (4, 0)



Step 2

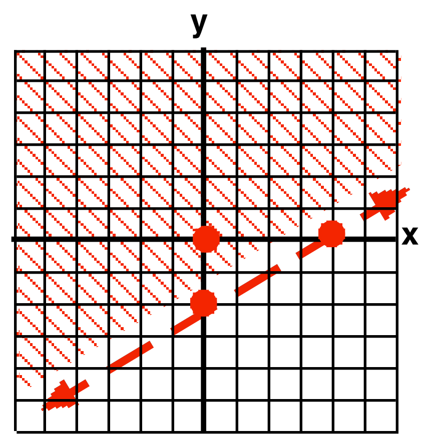
Pick any (x ,y) point not on the line and plug it into $x - 2y \le 4$ to see if it works. Selecting the point (0 , 0) results in

$$x - 2y \le 4$$

$$0) - 2(0) \le 4$$

$$-2 \le 4$$

which is **TRUE** so **(0 , 0) is a solution** and **ALL the shaded points** on the **same side** of the line that (0 , 0) is on are **ALSO solutions**.



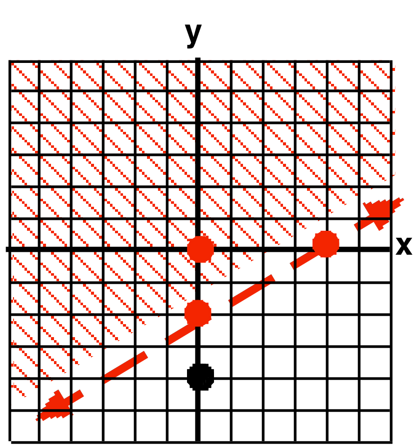
Check the points on the other side of the line to see that they DO NOT WORK

Pick an(x ,y) point on the unshaded side and plug it into $x - 2y \le 4$ to check and see that it DOES NOT WORK. Using the point (0 , –4) results in

$$0 - 2(-4) \le 4$$

$$8 \le 4$$

which is **False** so (0 , – 4) is **NOT** a solution and **NONE** of the points on the same side of the line that (0 , –4) is on are solutions.



Final Answer: