

Math-3A

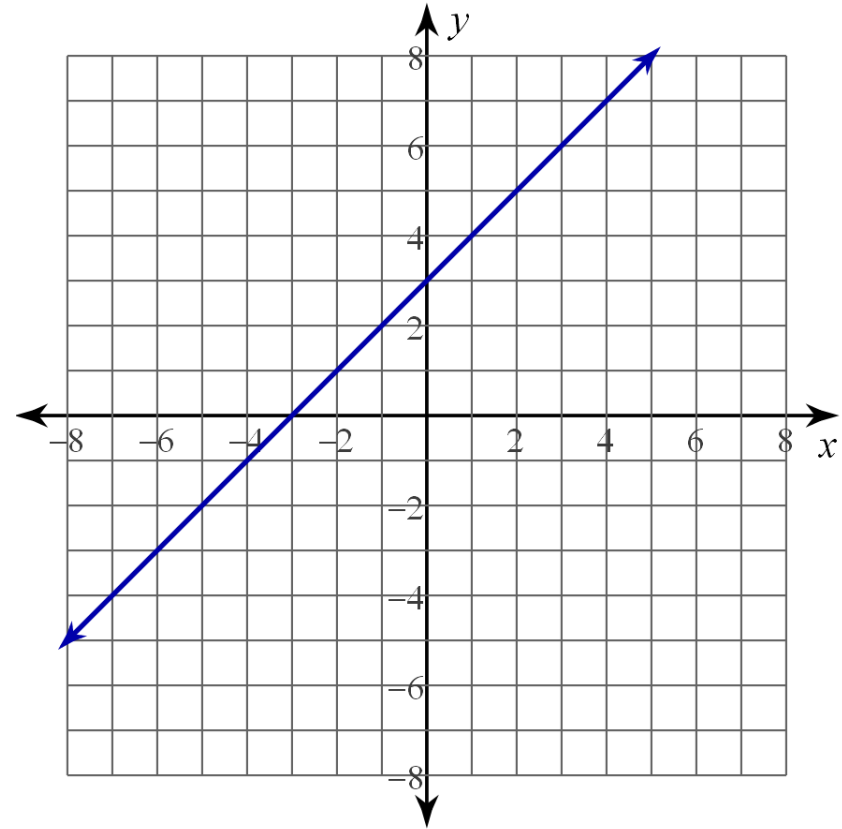
Lesson 12-2

Two Variable Inequalities
and
Systems of Inequalities

Draw the graph of the following:

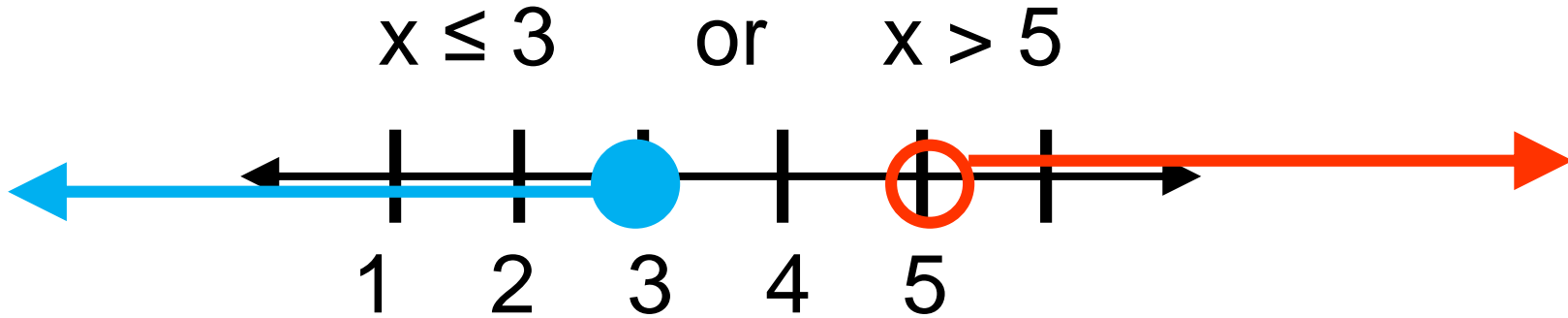
$$y = x + 3$$

**What is the solution
to a two-variable
equation: $y = x + 3$?**

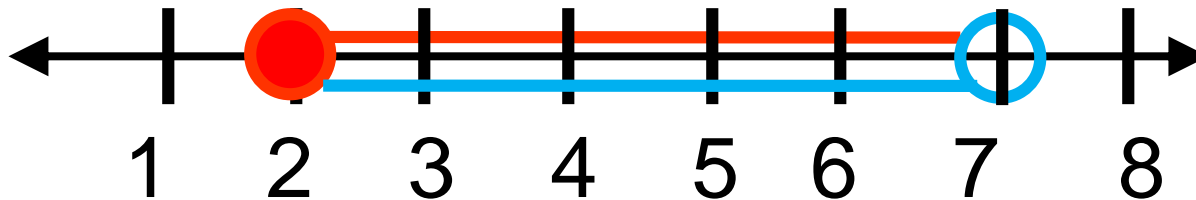


The x-y pairs that make the equation true. When graphed the solution to the equation is ALL of the points on the graph.

Single Variable Inequality: The “boundary numbers” separate the solution from the non-solution.



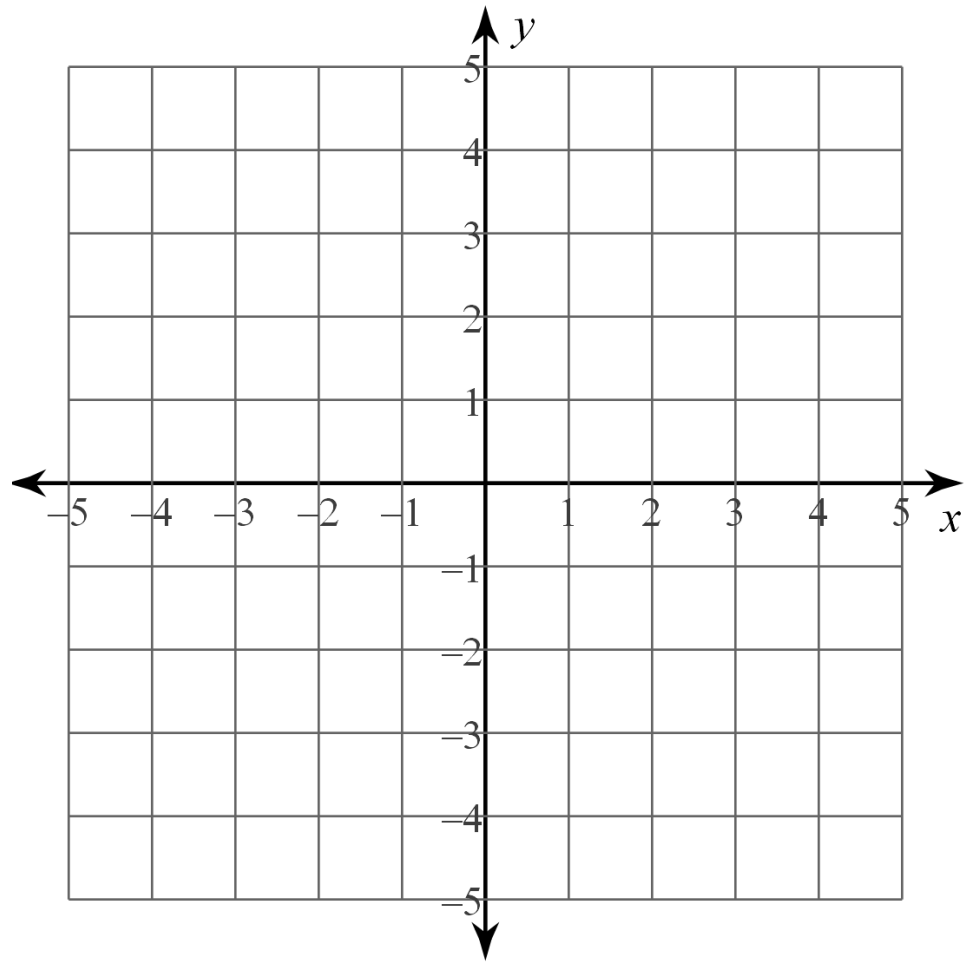
$$2 \leq x < 7$$



The shaded part of the graph is the solution.

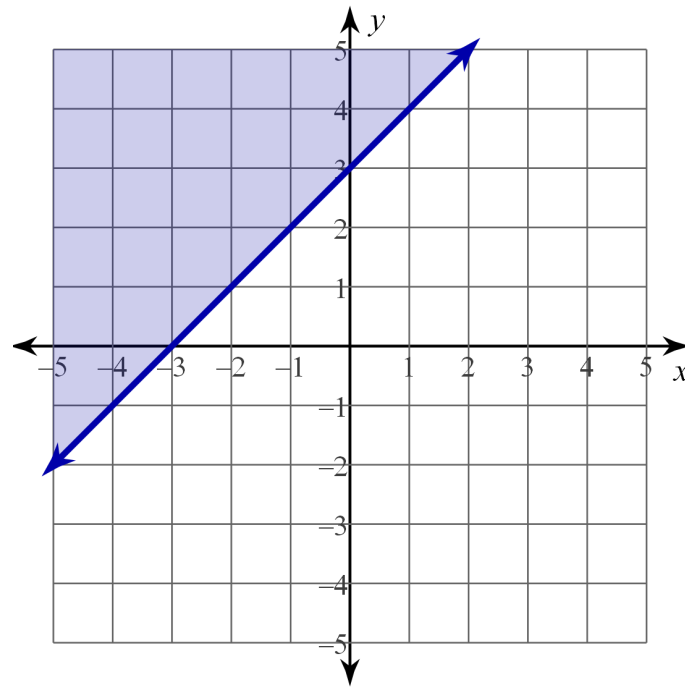
$$y \geq x + 3$$

What is the solution to a two-variable inequality $y \geq x + 3$?



The x-y pairs that make the inequality true. When graphed the solution to the equation is ALL of the points on the graph.

$$y \geq x + 3$$



The line: $y = x + 3$

Is the boundary between the solution and non-solution.
It divides the x-y plane into two halves.

The solution to the inequality is all of the x-y pairs in one of the “half planes”.

$$y > x + 3$$

Now it is just “>” not “≥”

Test two points:

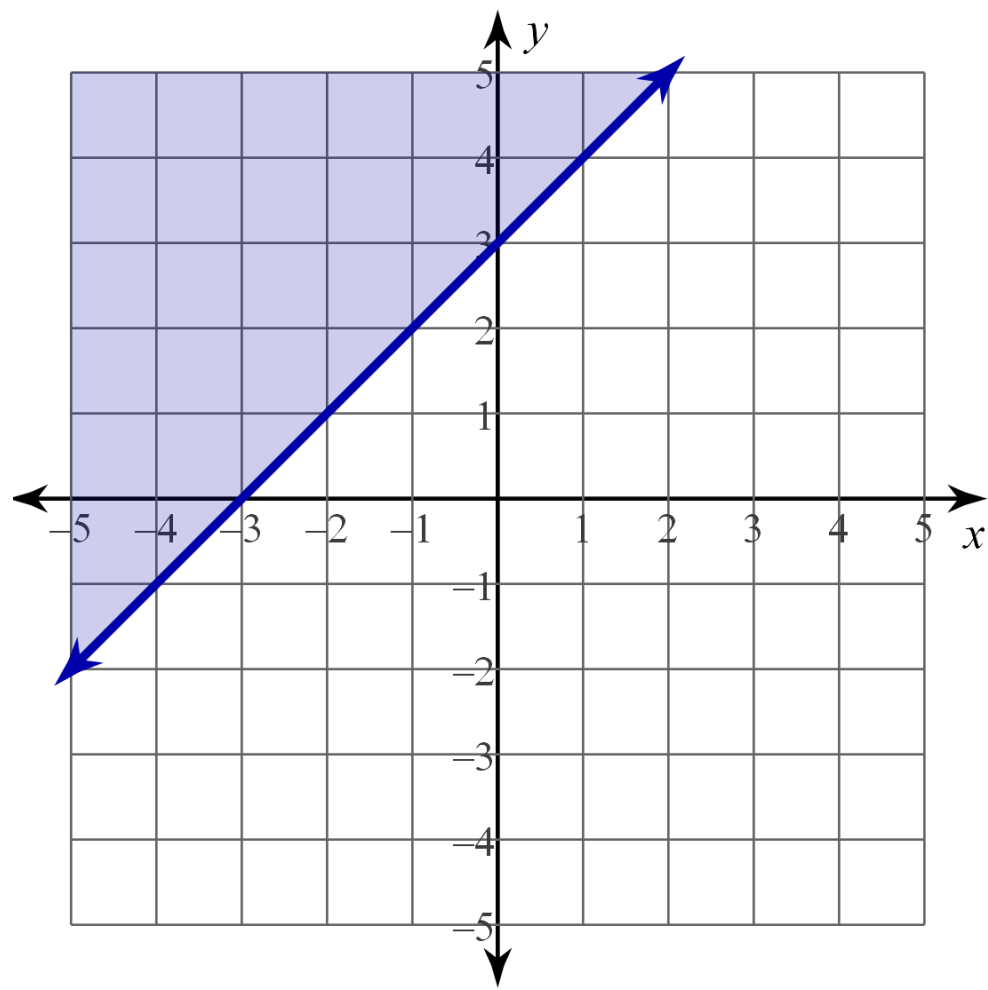
(0, 3)

(-1, 2)

Do the points on the line
make the inequality true?

no

How do we show that on
the graph?



$$y > x + 3$$

Now it is just “>” not “≥”

Test two points:

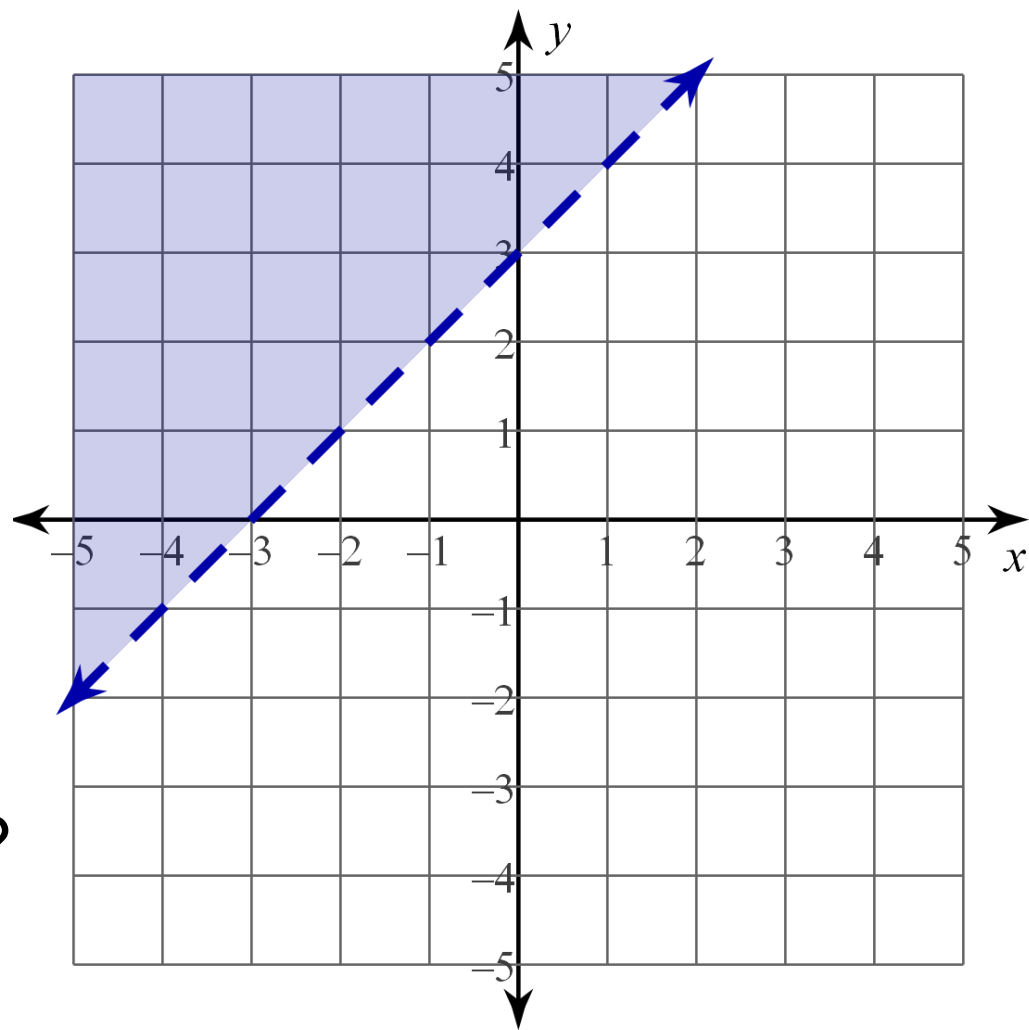
(0, 3)

(-1, 2)

Do the points on the line
make the inequality true?

no

How do we show that on
the graph?



Let's write a procedure on how to graph 2-variable inequalities.

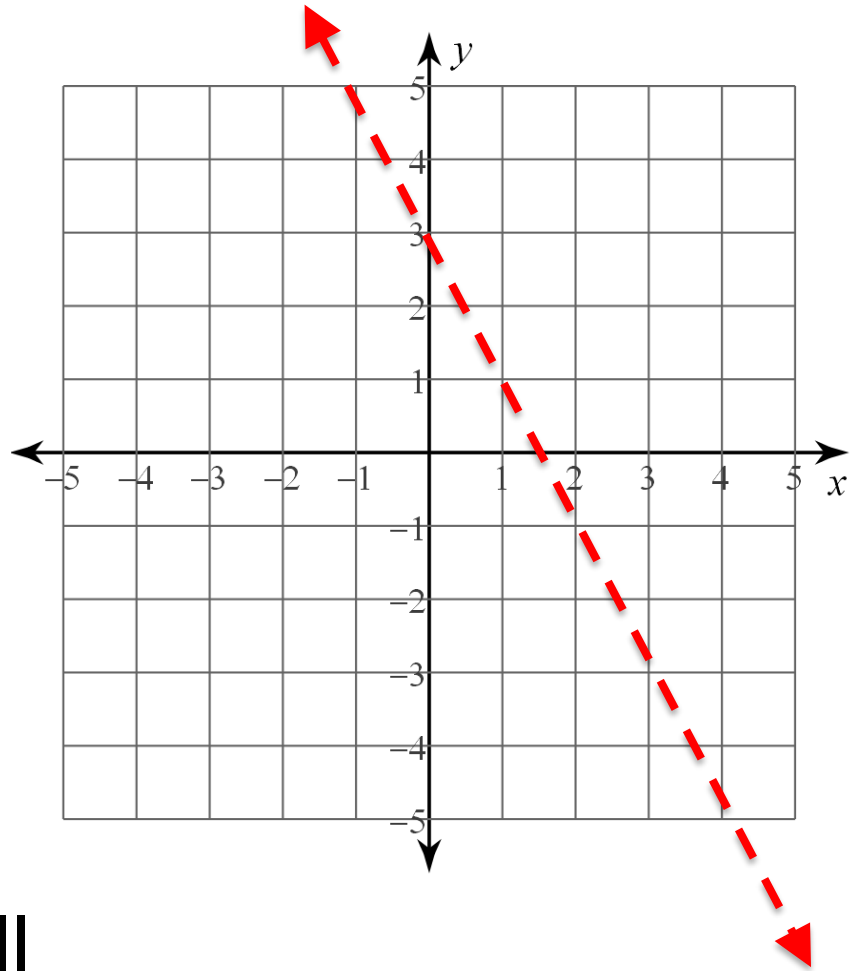
$$y > -2x + 3$$

1. Graph the line.

$$y = -2x + 3$$

2. If the inequality is “>” (not “≥”), the line will be dotted (not shaded).

3. If it is “≥” the line will be solid (shaded).



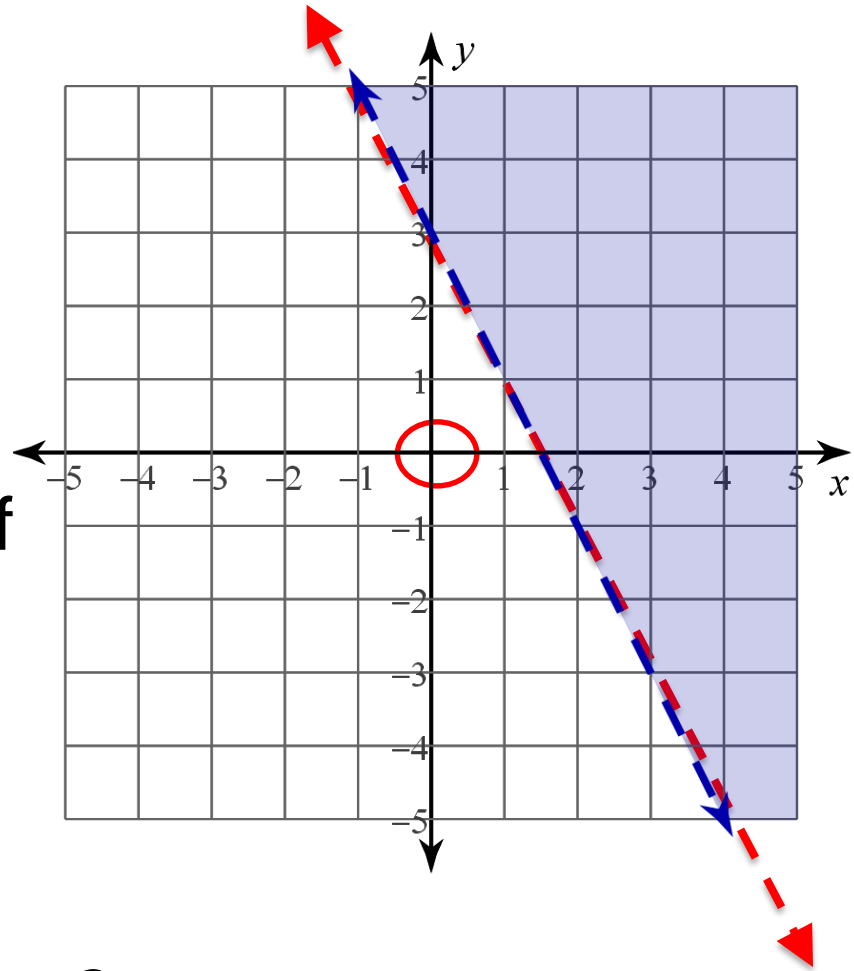
Let's write a procedure on how to graph 2-variable inequalities.

$$y > -2x + 3$$

4. Pick a point and see if it is the solution. If so, shade that side of the line, (otherwise shade the other side).

$$(0, 0) \quad 0 > -2(0) + 3 \quad \text{no}$$

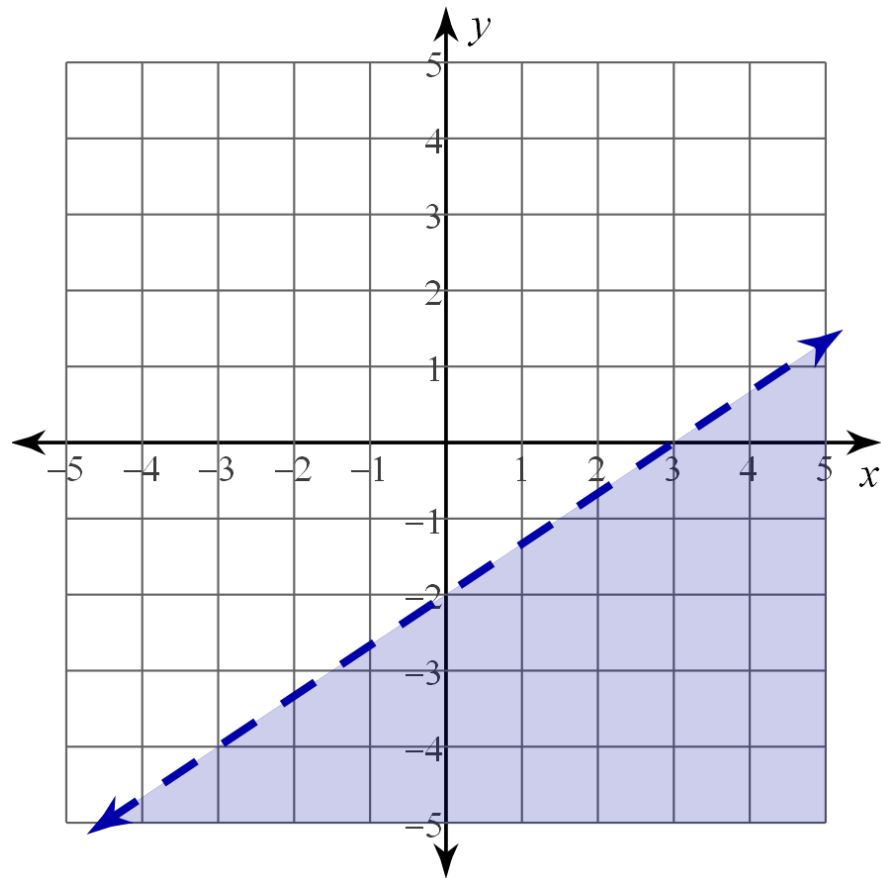
Shade other side of line from $(0, 0)$



Graph the following inequality.

$$2x - 3y > 6$$

Why does “>” end up being shaded below the line?



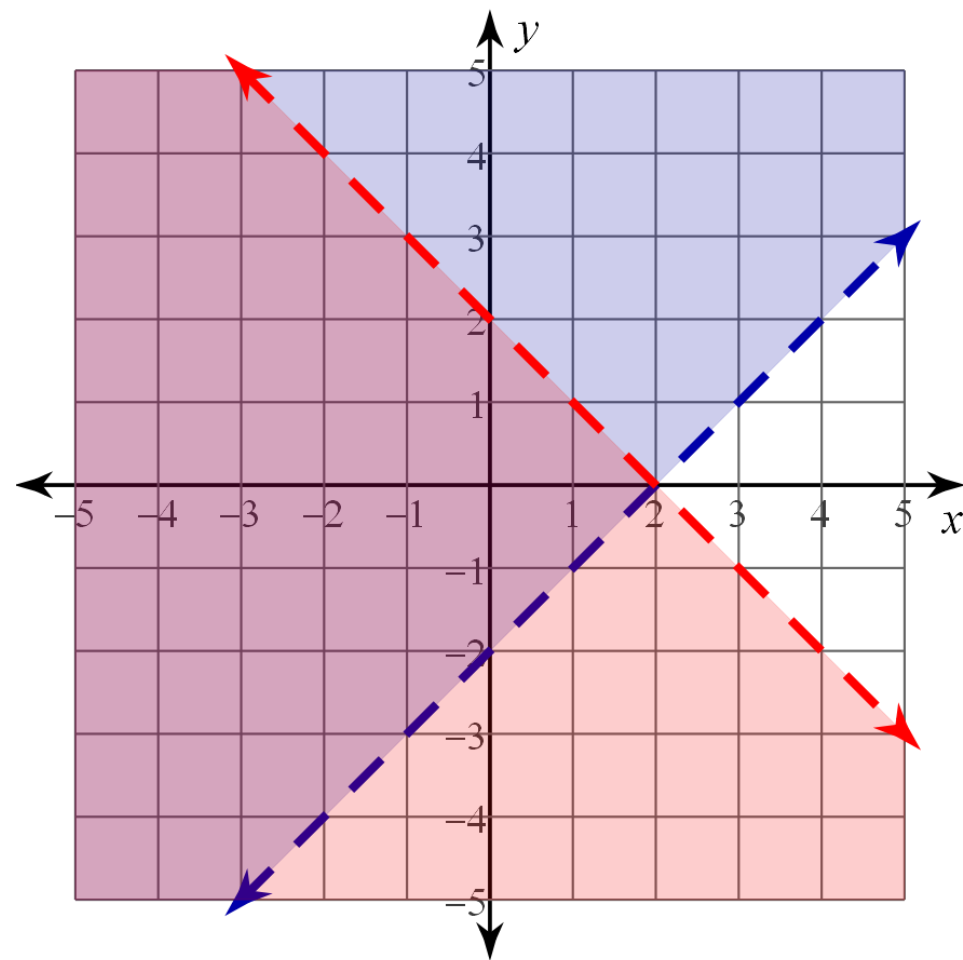
Systems of Inequalities

More than one 2-variable inequality graphed on the same x-y plot.

$$y > x - 2$$

$$y < -x + 2$$

Two lines that cross divide the plane into 4 regions. Which region contains the points that are the solution to the system of inequalities?



$$y > x - 2 \text{ AND } y < -x + 2$$

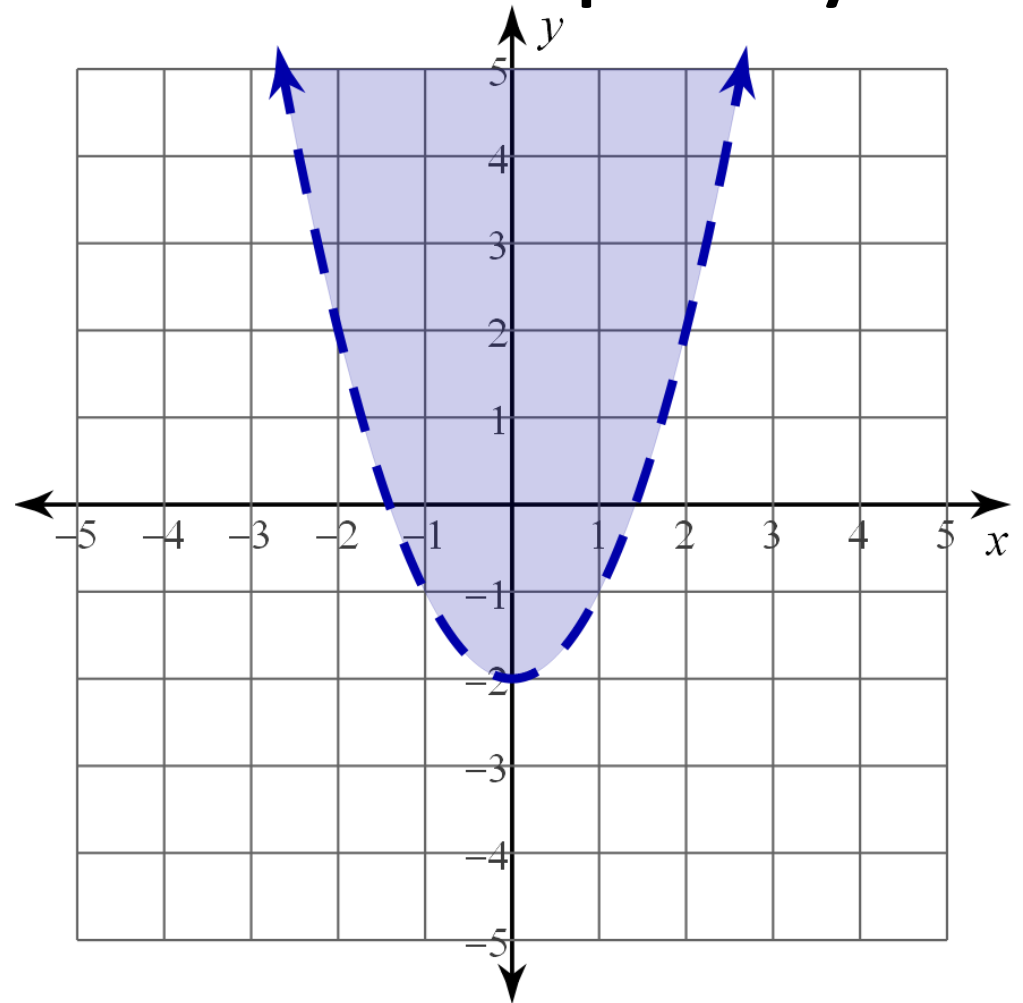
Solution: the points in the “overlap” region.

Non-linear 2 Variable inequality

$$y > x^2 - 2$$

Is the parabola solid or dotted?

Is the solution the region above or below the parabola?

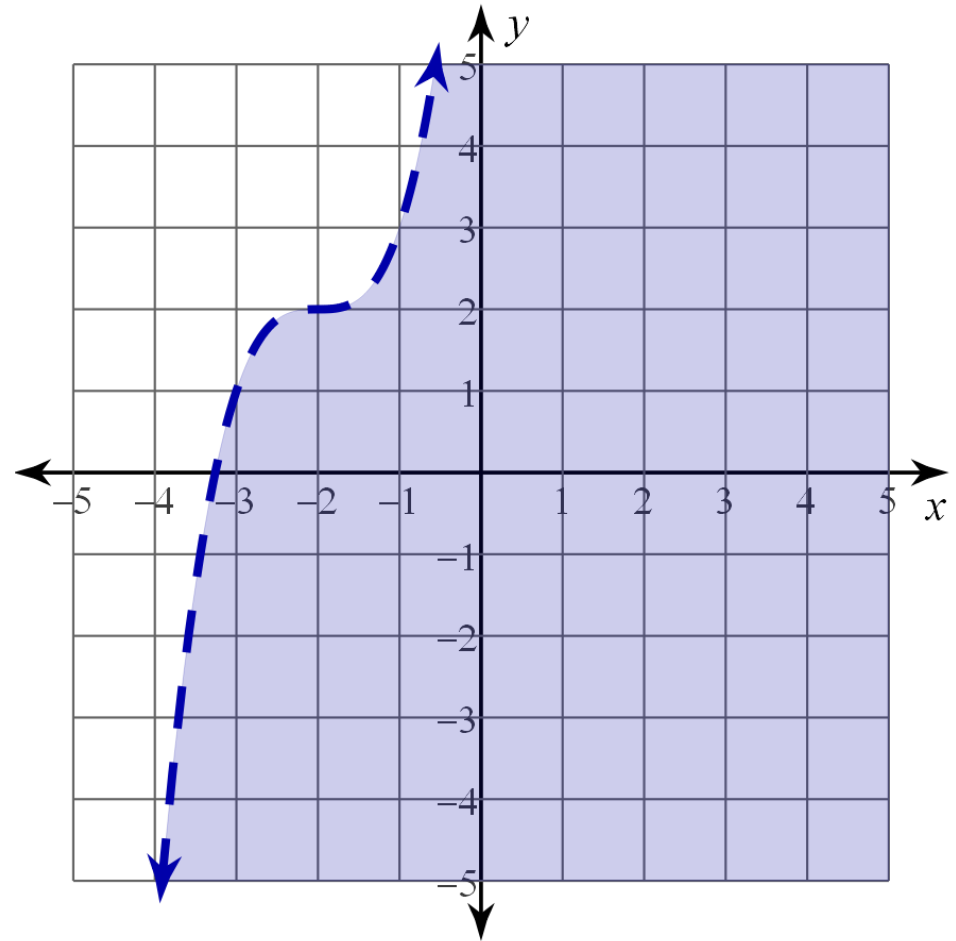


Non-linear 2 Variable inequality

$$y < (x + 2)^3 + 2$$

Is the curve solid or dotted?

Is the solution the region above or below the curve?

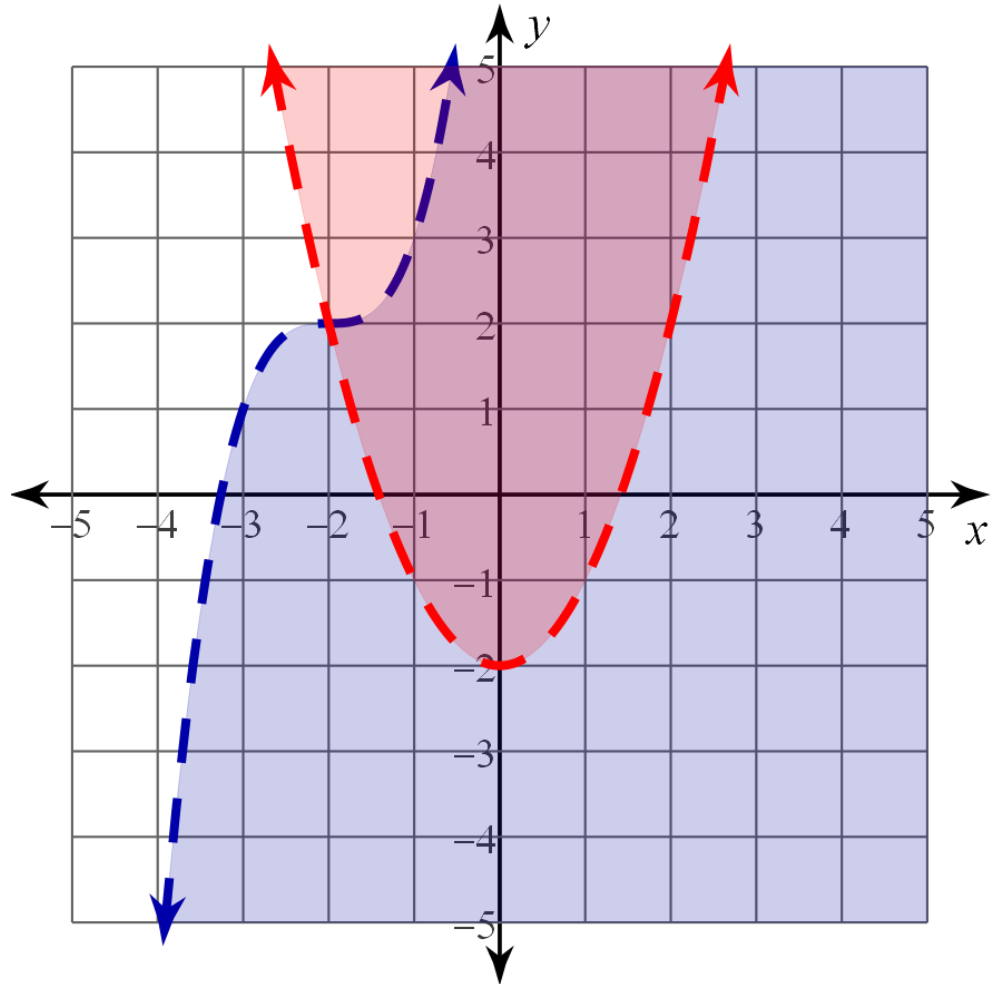


Systems of Non-linear 2 Variable inequalities

$$y < (x + 2)^3 + 2$$

$$y > x^2 - 2$$

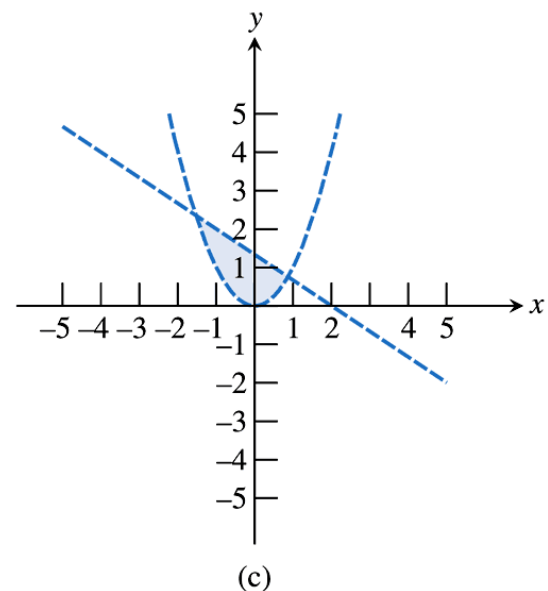
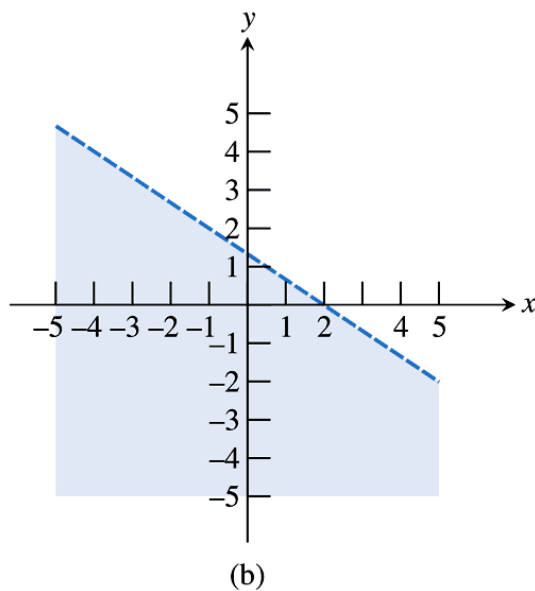
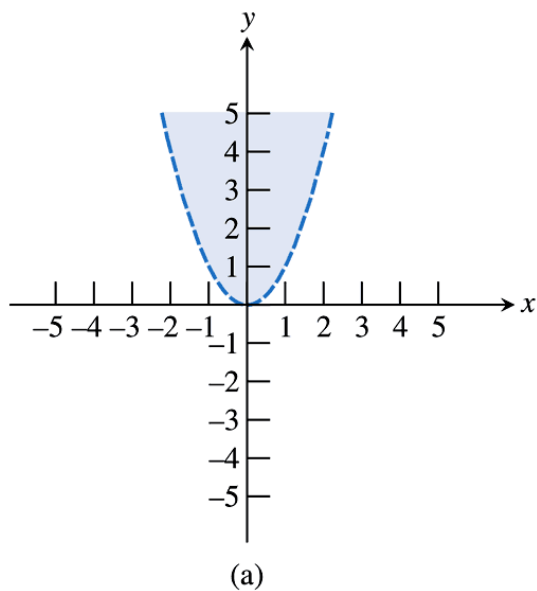
Which region is the solution?



Solving a System of Inequalities Graphically

Solve the system $2x + 3y < 4$ and $y > x^2$.

Graph both inequalities and find their intersection.



Your turn: Graph the system of inequalities:

$$y \leq -\frac{1}{2}(x-3)^2 + 2 \quad y > -3x^3 + 6x^2 - x - 4$$

