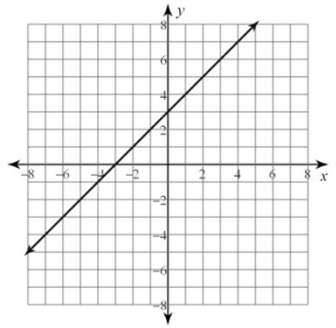
Math-3A
Lesson 12-2

Two Variable Inequalities
and
Systems of Inequalities

Draw the graph of the following:

$y = x + 3$

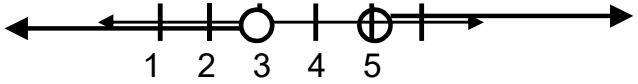
What is the solution to a two-variable equation: y = x + 3 ?



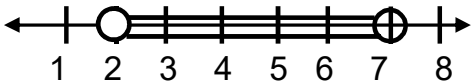
The x-y pairs that make the equation true. When graphed the solution to the equation is ALL of the points on the graph.

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

$x \leq 3$ or $x > 5$



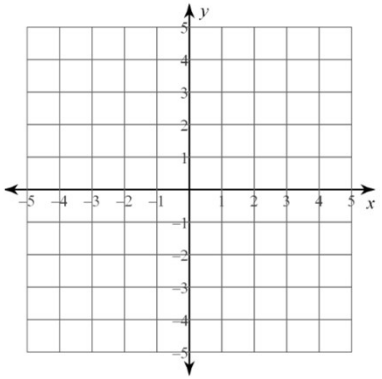
$2 \leq x < 7$



The shaded part of the graph is the solution.

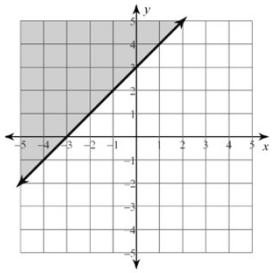
$y \geq x + 3$

What is the solution to a two-variable inequality y ≥ 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".

$y > x + 3$

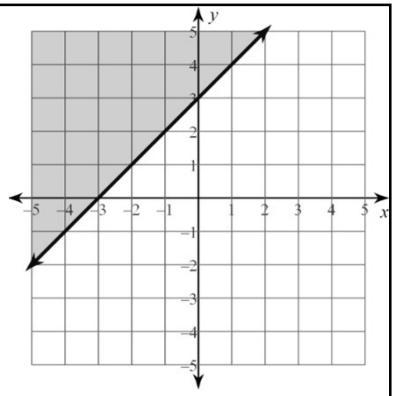
Now it is just ">" not "≥"

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?



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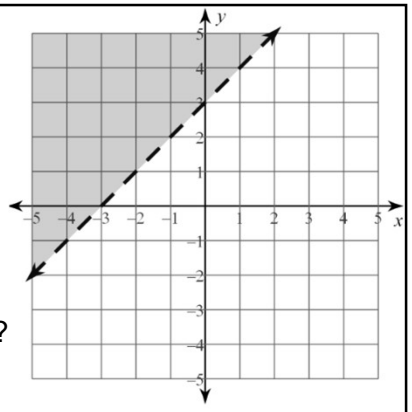


Let's write a procedure on how to graph 2-variable inequalities.

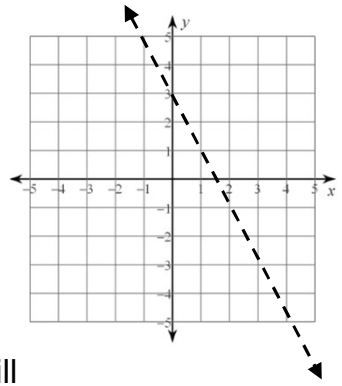
$y > -2x + 3$

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).



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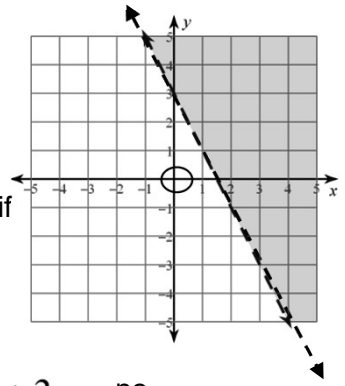


4. Pick a point and see if it is the solution. If so, shade that side of the line, (otherwise shade the other side).

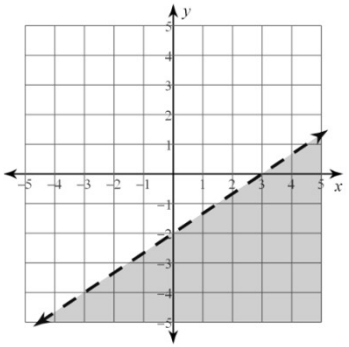
(0, 0) $0 > -2(0) + 3$ no

Shade other side of line from (0, 0)

Graph the following inequality.

$$2x - 3y > 6$$

Why does ">" end up being shaded below the line?



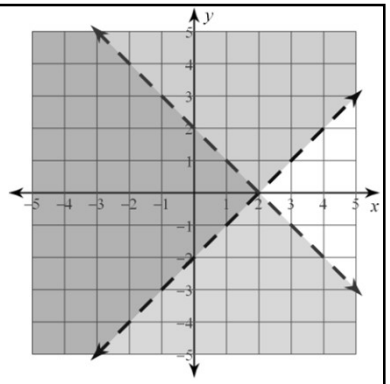
Systems of Inequalities

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 AND y < -x + 2

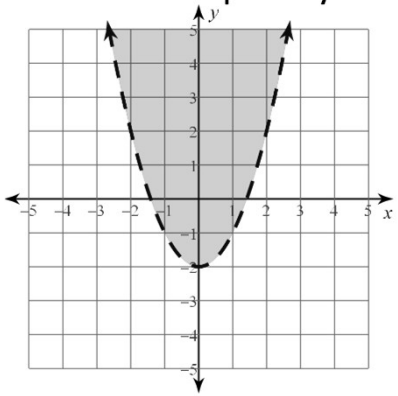
Solution: the points in the "overlap" region.

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?

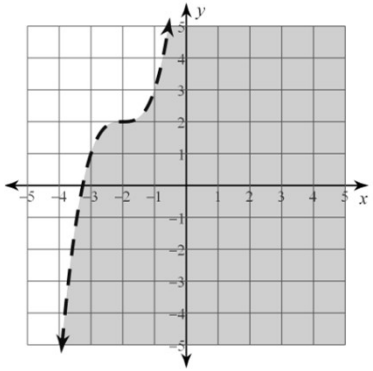


Non-linear 2 Variable inequality

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

Is the curve solid or dotted?

Is the solution the region above or below the curve?

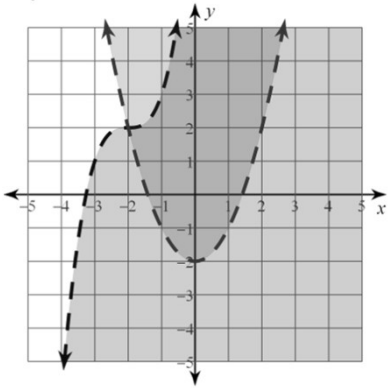


Systems of Non-linear 2 Variable inequalities

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

$y > x^2 - 2$

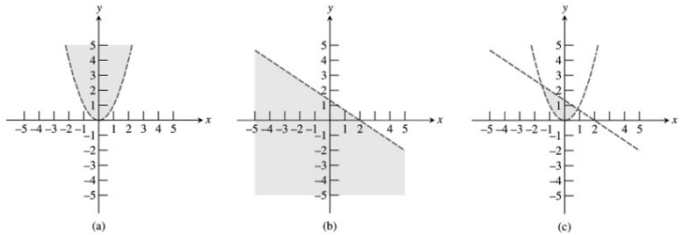
Which region is the solution?



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:

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