Graphing Systems of Inequalities

The **solution of a system of linear inequalities** is the intersection of the solution to each inequality. Every point in the intersection regions satisfies the solution. Determine if the following points are a solution to the inequality:

$x + 5y < -1$ ✓ yes

$2y \geq -3x - 2$ X no

(0, -1)

x	y	$x + 5y < -1$	$2y \geq -3x - 2$
		$0 + 5(-1) < -1$	$2(-1) \geq -3(0) - 2$
		$0 - 5 < -1$	$-2 \geq 0 - 2$
		$-5 < -1$ ✓	$-2 \geq -2$ ✓

(2, 3)

x	y	$x + 5y < -1$
		$2 + 5(3) < -1$
		$2 + 15 < -1$
		$17 < -1$ X

Steps for Graphing Systems of Inequalities

Step 1: Solve each inequality for y (if necessary).

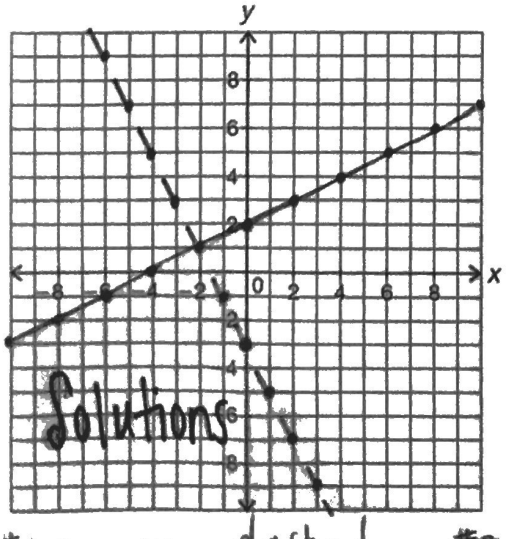
Step 2: Graph the boundary lines of each inequality. Use dashed lines if the inequality is < or >. Use a solid line if the inequality is ≤ or ≥.

Step 3: Shade the appropriate half plane for each inequality.

Step 4: Identify the solution of the system of inequalities as the intersection of the half planes from Step 3.

Quick Reminder: Whenever you **multiply** or **divide** an inequality by a negative number, you must **flip** the inequality sign.

A. $y < -2x - 3$
$y \leq \frac{1}{2}x + 2$



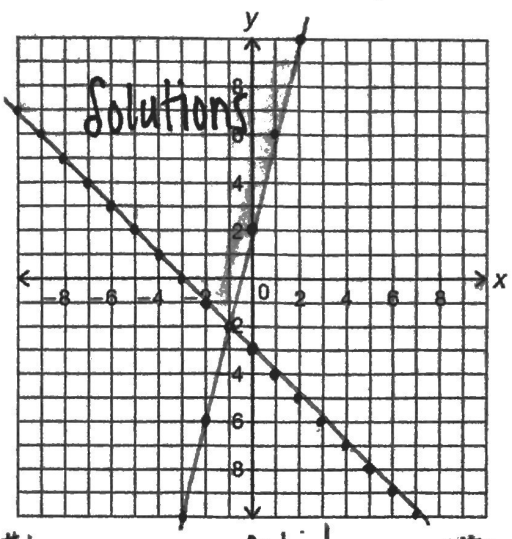
#1 Type of Line: dashed #2 solid

Slope: $\frac{-2}{1}$ Y-int: -3 $m = \frac{1}{2}$ $b = 2$

Shade: below below

B. $x + y \geq -3$
$-x \quad -x$
$y \geq -1x - 3$

$-4x - y \leq -2$
$-4x \quad -4x$
$\frac{+y}{-1} \leq \frac{-4x}{-1} - \frac{2}{-1}$
$y \geq 4x + 2$



#1 Type of Line: solid #2 solid

Slope: $\frac{-1}{1}$ Y-int: -3 $m = \frac{4}{1}$ $b = 2$

Shade: above above

Warning...Potential Misconception!!!

$x + y \leq 2$

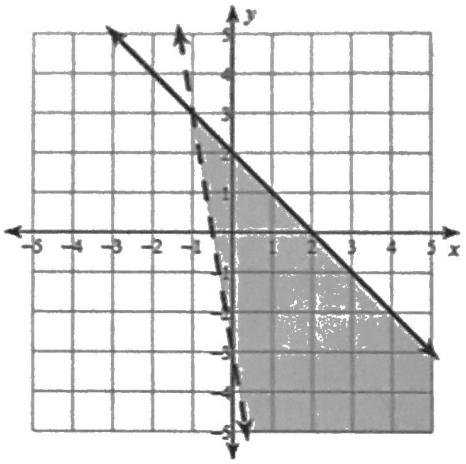
$6x + y > -3$

x y

Do you think the point (-1, 3) is a solution to the inequality?

check: $-1 + 3 \leq -2$

$2 \leq -2$ x no



Determining Solutions Located on a Boundary Line

If a point lies on a **solid** line, it is a solution

If a point lies on a **dashed** line, it is NOT a solution

It must be true or a solution for both inequalities/boundary lines to be a solution!

Creating a System of Inequalities from a Graph

Practice: Name each system of inequalities from the graph:

Line 1: $y \leq \frac{1}{2}x + 2$

Type of Line: solid

Slope: $\frac{1}{2}$ Y-int: +2

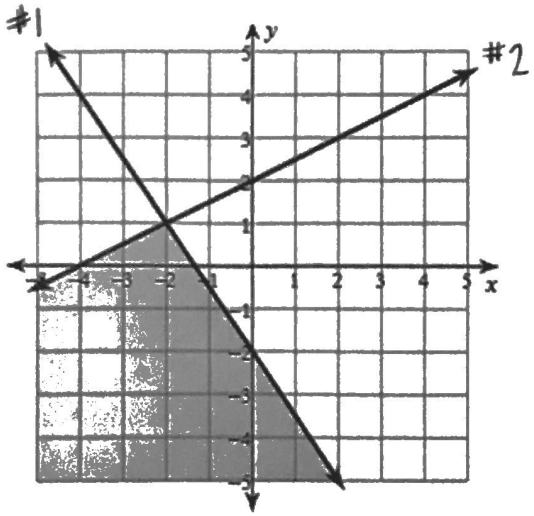
Shade: below

Line 2: $y \leq -\frac{3}{2}x - 2$

Type of Line: solid

Slope: $\frac{-3}{2}$ Y-int: -2

Shade: below



Line 1: $y \leq -3x - 2$

Type of Line: solid

Slope: $\frac{-3}{1} = -3$ Y-int: -2

Shade: below

Line 2: $y > 2x + 3$

Type of Line: dashed

Slope: $\frac{2}{1} = 2$ Y-int: +3

Shade: above