PreCalculus 11 Date __________________

Unit 8: Systems of Equations; Linear & Quadratic Inequalities

8.4 Linear Inequalities in Two Variables

Recall – Linear Inequalities in One Variable

Solve $2x + \cancel{5} > 3\cancel{x} - 8$

$-3x \quad -5 \quad -3x \quad -5$

$-x > -13$

$\boxed{x < 13}$

inequality statement

$\{x \mid x < 13, x \in \mathbb{R}\}$ set notation

$(-\infty, 13)$ interval notation

* $x \leq 13$

$(-\infty, 13]$

Linear Inequalities in 2 Variables:

$Ax + By < C$

$Ax + By \leq C$

$Ax + By > C$

$Ax + By \geq C$

Describes a region in the Cartesian (coordinate) plane

The ordered pair (x, y) is a solution of the linear inequality if $x + y$ satisfies the inequality statement

Solution Region:

- All the points in the Cartesian plane that satisfy an inequality
- the solution set

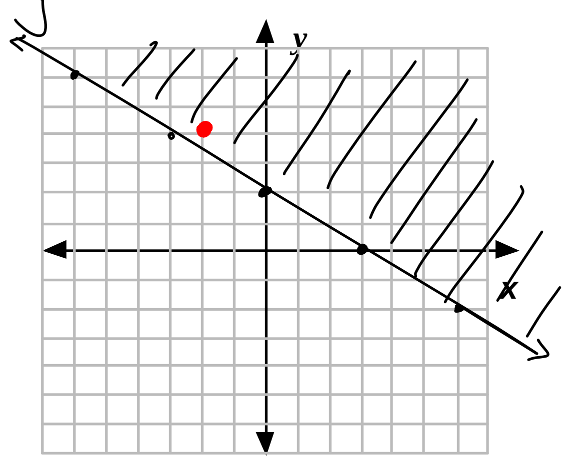
Boundary:

- line or curve that seperates the plane into 2 regions (solution region + non-solution region)

$\geq$ or $\leq$ solid boundary - it is part of the solution

$>$ or $<$ dashed boundary - it is not part of the solution

ex. Graph $2x + 3y \geq 6$



① determine + graph the boundary

$3y \geq -2x + 6$

$y \geq -\frac{2}{3}x + 2$

② use test point to determine the solution region

$(0,0)$ $\quad 2(0) + 3(0) \overset{?}{\geq} 6$

$0 \ngeq 6 \quad \therefore (0,0)$ is not part of the solution

Is $(-2, 4)$ part of the solution?

Yes, it is in the shaded solution region

check

$2(-2) + 3(4) \overset{?}{\geq} 6$

$8 \geq 6$ ✓

ex. Graph $10x - 5y > 0$

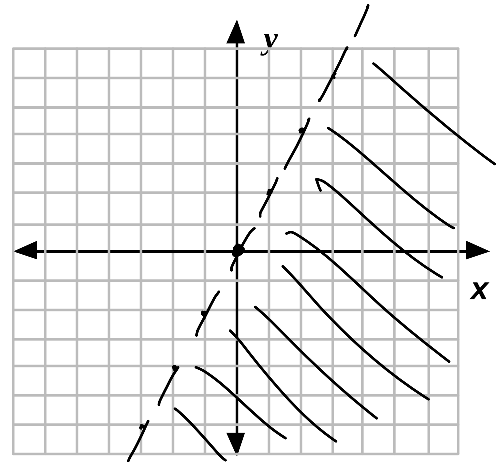
$-5y > -10x$

$y < 2x$

Test $(-1, 1)$

$10(-1) - 5(1) \overset{?}{>} 0$

$-15 > 0$ ✗

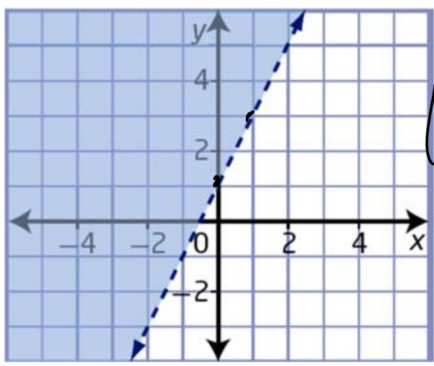


Shortcut? once isolated y

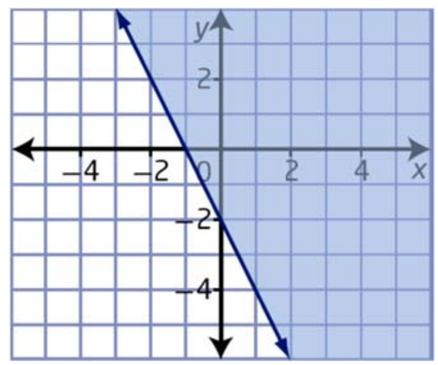
$>$ or $\geq$ region above boundary

$<$ or $\leq$ region below boundary

ex. Write an inequality for each graph below:



$\boxed{y > 2x + 1}$



$\boxed{y \geq -2x - 2}$

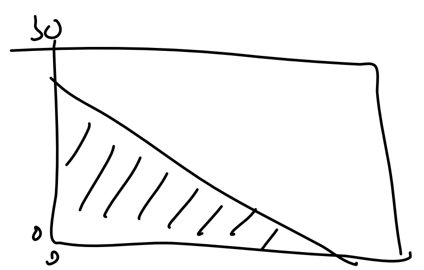
ex. Suppose you are constructing a tabletop using an aluminum frame and glass top. The most that you can spend on materials is \$50. Laminated safety glass costs \$60/m^2, and aluminum costs \$1.75/ft. Find all possible combinations of materials sufficient to make the tabletop.

Let x = area of glass Let y = length of aluminum

$60x + 1.75y \leq 50$

$1.75y \leq -60x + 50$

$y \leq \dfrac{-60x + 50}{1.75}$



Practice: pg. 472/ # 1bc, 2bc, 3, 4, 5(sketch viewing window), 9, 13, 15