

9.1 Linear Inequalities in Two Variables

Chapter 9: Linear and Quadratic Inequalities

9.1 Linear Inequalities in Two Variables

Graph $4x + 2y = 10$

Each (x,y) pair on the line is a solution to the equation.

and

$4x + 2y \leq 10$

Each (x,y) pair _____ the line is a solution to the inequality

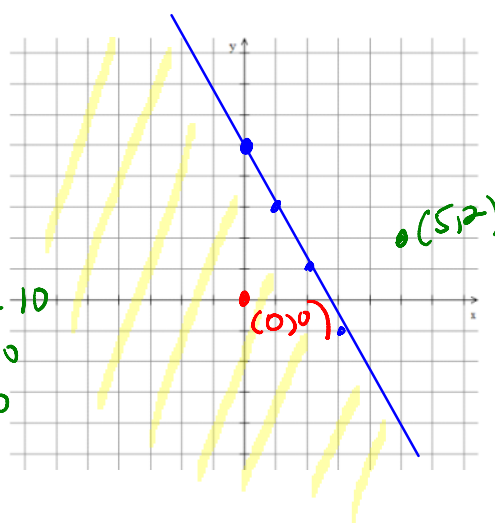
$$\frac{2y}{2} = \frac{-4x + 10}{2}$$
$$y = \frac{-2x + 5}{1}$$

$$4(0) + 2(0) \leq 10$$
$$0 \leq 10$$

True

$$4(5) + 2(2) \leq 10$$
$$20 + 4 \leq 10$$
$$24 \leq 10$$

False



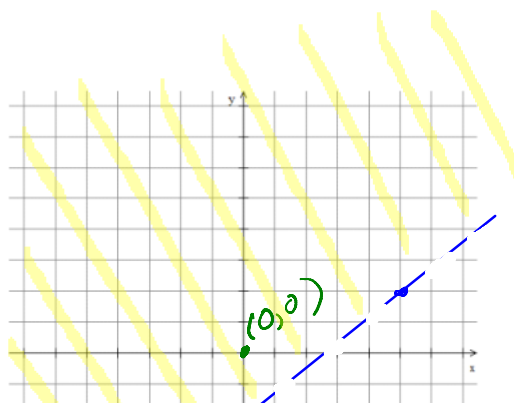
In general, to graph an inequality:

- 1) Graph the boundary line (equality)
- 2) -If \geq or \leq , then **solid line** (points on the line are included)
-If $>$ or $<$, then **dashed line** (the points on the line are *not* included)
- 3) Test a point not on the boundary line and shade the region that satisfies the inequality. (Origin is the easiest choice)

Example:

Graph $4x - 5y < 10$

$$4x - 5y = 10$$
$$\frac{-5y}{-5} = \frac{-4x + 10}{-5}$$
$$y = \frac{4}{5}x - 2$$



Graph $4x - 5y < 10$

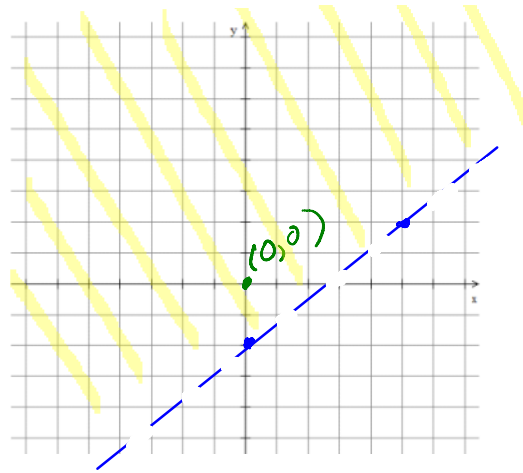
$$4x - 5y = 10$$

$$\frac{-5y}{-5} = \frac{-4x + 10}{-5}$$

$$y = \frac{4}{5}x - 2$$

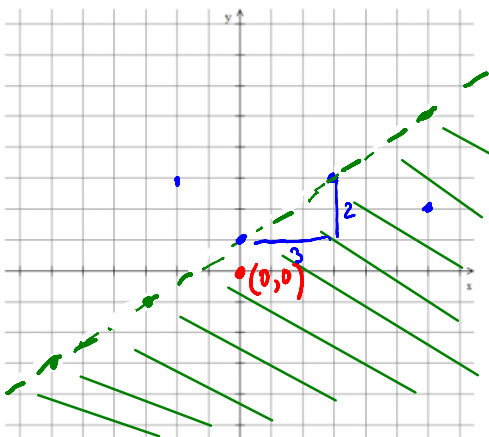
$$4(0) - 5(0) < 10$$

$$0 < 10$$



Example:

a) Given the graph, determine its equation.



$$y < \frac{2}{3}x + 1$$

$$3y < 2x + 3$$

$$y = \frac{2}{3}x + 1$$

$$y \square \frac{2}{3}x + 1$$

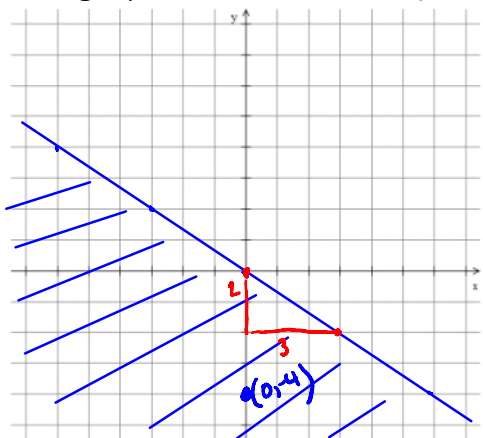
$$0 \square \frac{2}{3}(0) + 1$$

$$0 \square 1$$

b) Which of the following points satisfy the inequality?

- (6, 2) ✓
- (0, 0) ✓
- (-2, 3) ✗

Given the graph, determine its equation.



$$y = -\frac{2}{3}x$$

$$y \square -\frac{2}{3}x$$

$$-4 \square -\frac{2}{3}(0)$$

$$-4 \square 0$$

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

$$3y \leq -2x$$

$$3y + 2x \leq 0$$

Example.

A mosaic is made of tile and stone. If the budget for the mosaic is \$180, and the tiles cost \$4.00/ft², while stone cost \$4.50/kg, draw a graph which represents all possible combinations of stone and tiles.

$$4t + 4.5s \leq 180$$

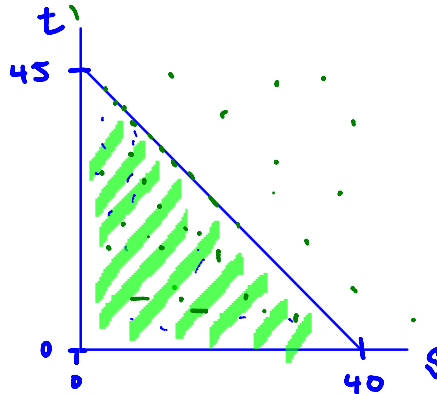
t	S
0	40
45	0

$$4s = 180$$

$$s = 40$$

$$4t = 180$$

$$t = 45$$



*-the shaded region represents all (s,t) combinations less than \$180
 - the line represents all (s,t) combinations that equal \$180 (∴ a solid line)

Example:

A smartphone plan charges 10 cents/min and each megabyte of data costs 10 cents. Another plan allows unlimited talk and data for \$50/month. Under which circumstances is each plan better?

m = minutes

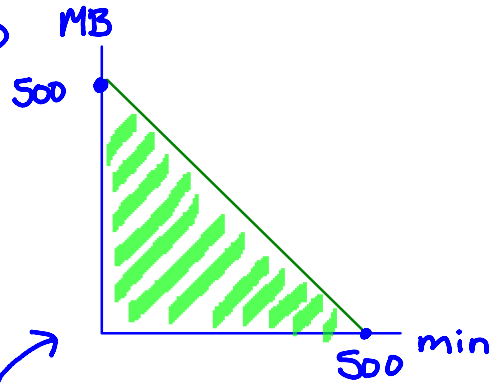
MB = megabytes.

Plan A

Plan B

$$0.10m + 0.10MB \leq 50$$

m	MB
0	500
500	0



Any (m, MB) combination in the shaded region indicates that plan A. is better.

Assignment: p472 #1-4(ace's), 5ac, 8ace, 9, 11abc, 12, 13