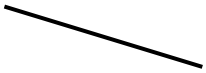
Math M118: Lecture Notes For Chapter 7

Slope-Intercept Equation $y = mx + b$ *(m is the slope, b is the y-intercept)*

***m* > 0** or positive slope, then the line is increasing or rising, as $y = 2x - 3$



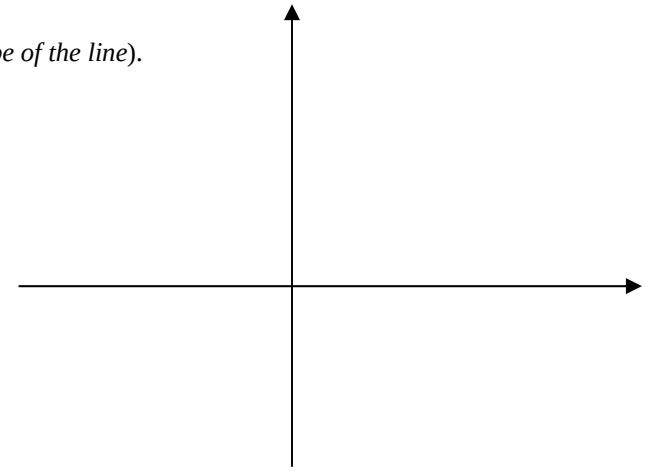
***m* < 0** or negative slope, then the line is decreasing or falling, as $y = -3x + 4$

***m* = 0**, then the line is horizontal, as $y = 2$

***m* = undefined,** no slope, then the line is vertical, $x = 3$

b determines where the line crosses the *y*-axis: above origin ($b > 0$), below ($b < 0$) or through ($b = 0$).

Example 1: Graph $2x - y = 4$, *(hint: isolate y first to know the shape of the line)*.



Example 2: Match the following equations with the correct graph:

1) $y = -2x + 4$; graph:_____

2) $y = 2x + 4$; graph:_____

3) $y = -5x - 2$; graph:_____

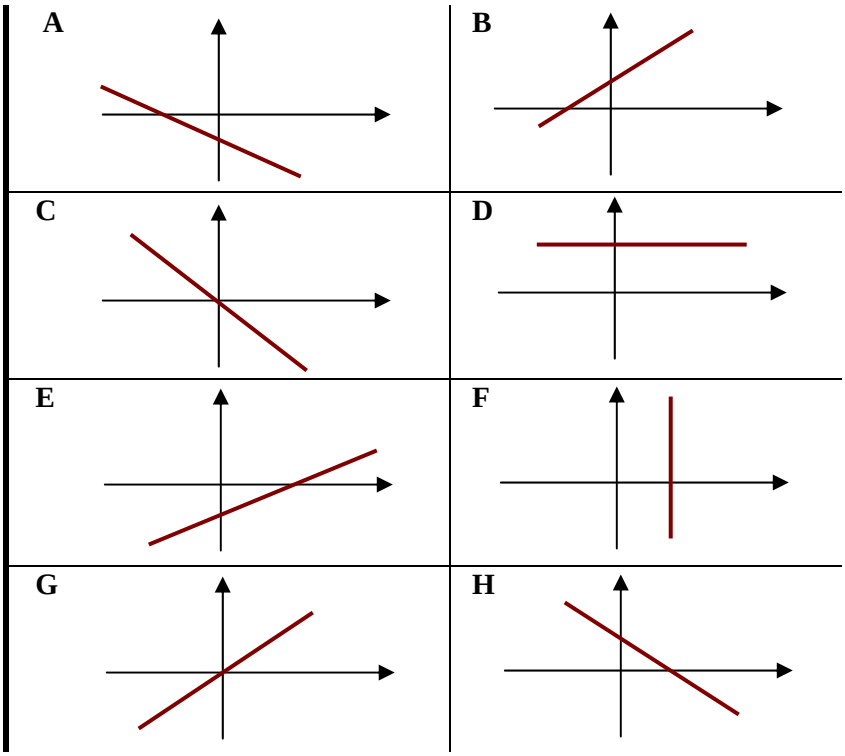
4) $y = 4x - 2$; graph:_____

5) $y = -2x$; graph:_____

6) $y = 3x$; graph:_____

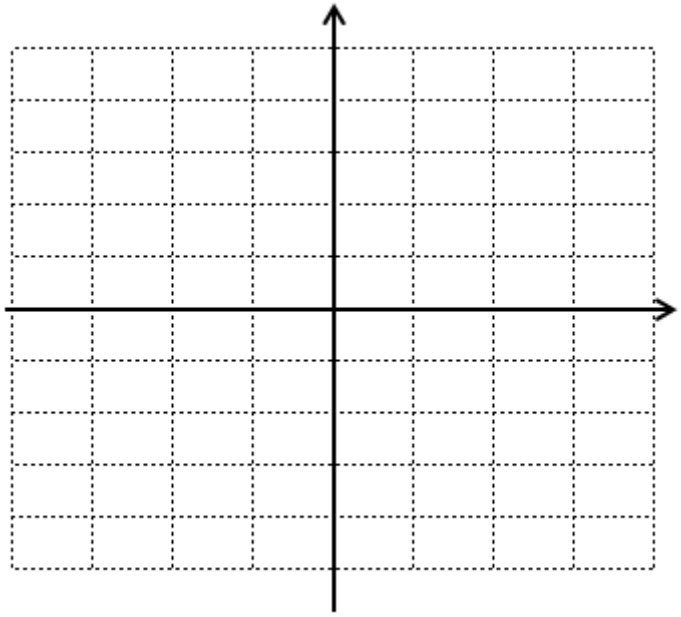
7) $y = 2$; graph:_____

8) $x = 3$; graph:_____



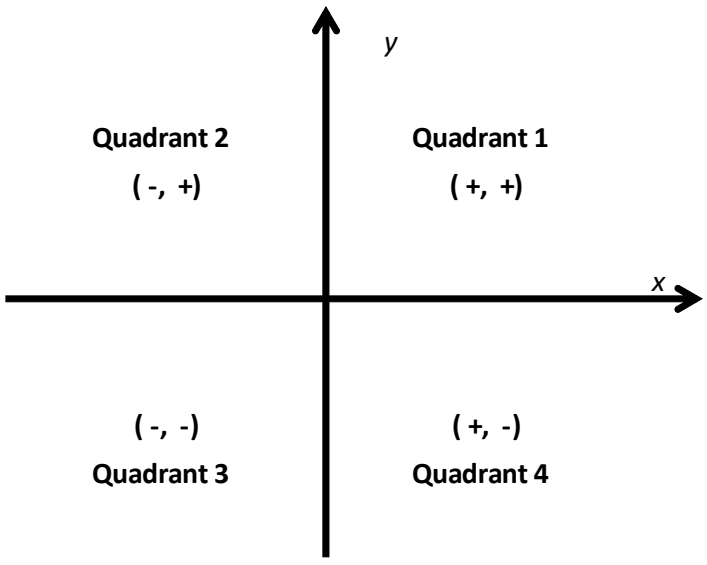
Example 3: Locate the following points:

1) *A* (2, 0)
2) *B* (-2, 1)
3) *C* (-2, -3)
4) *D* (2, -3)
5) *E* (0, -2)
6) *F* (3, 2)
7) *G* (0, 3)
8) *H* (-3, 0)



Notice:

- Any point on the *y*-axis has $x = 0$, or it is called the ***y*-intercept** — Points *E* and *G*
- Any point on the *x*-axis has $y = 0$, or it is called the ***x*-intercept** — Points *A* and *H*
- Points in the first quadrant has (+ , +), both positive *x* and *y:* — Point *F*, $x > 0$, $y > 0$
- Points in the second quadrant has (- , +), negative *x*, positive *y:* — Point *B*, $x < 0$, $y > 0$
- Points in the third quadrant has (- , -), both negatives *x* and *y:* — Point *C*, $x < 0$, $y < 0$
- Points in the fourth quadrant has (+ , -), positive *x*, negative *y*, — Point *D*, $x > 0$, $y < 0$



Linear Inequalities:

Example 4:	$2x + y - 10 \leq 0$	can be written as:	$2x + y \leq 10$
Example 5:	$2y \leq x + 4$	can be written as:	$-x + 2y \leq 4$
Example 6:	$2x - 5 \leq 3y$	can be written as:	$2x - 3y \leq 5$
Example 7:	$-x - y \leq 3$	can be written as:	$x + y \geq -3$

Notice that when you multiply by negative, the inequality **is reversed.**

$5 > -3$, multiply by negative: $-5 < 3$

Graphing an Inequality:

Example 8: Graph $2x + y - 5 \leq 0$

- Move the constant (-5) , and change to equality:

- Isolate *y* to get two points and to visualize the shape

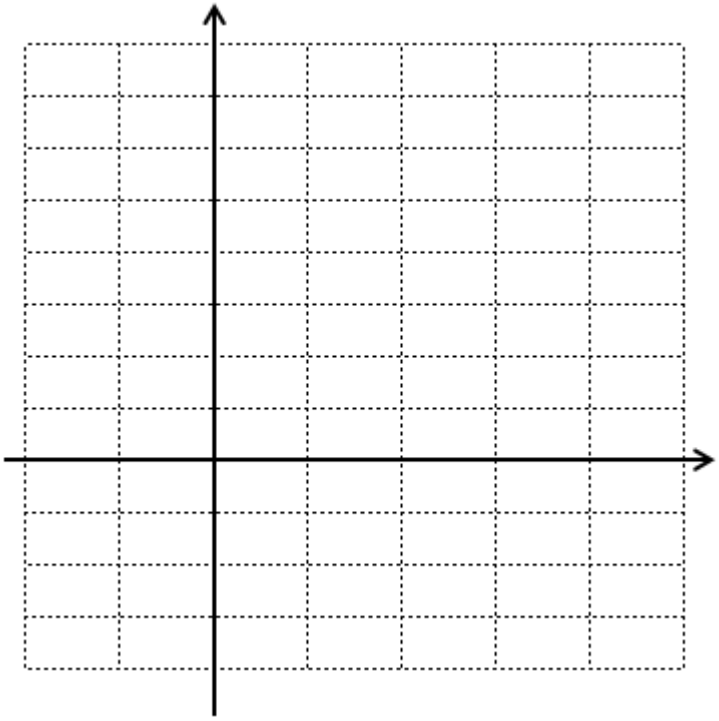
- Give at least 2 values to *x*

  x = , *y* =

  x = , *y* =

- Plot the line and decide which half is the solution

Take a point that in Not located on the line and check if it is included in the solution or not.
If it is, then the whole half is included.
For example , take the point (0,0)
Where x = 0, and y =0
Substitute in step 1:



Example 9: Graph the solution set for:

$$3x + 2y - 12 \leq 0$$

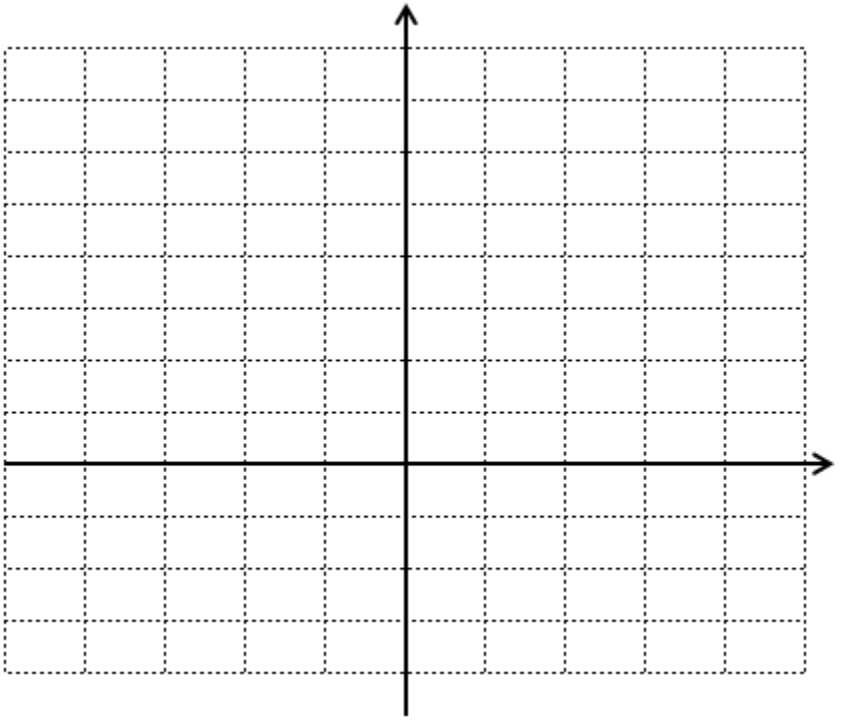
$$-x + 2y \leq 4$$

$$x \geq 0,\ y \geq 0$$

Find the coordinates of the corner points

- Take each inequality, move the constant if there is , and change to equality
- Isolate y to get two points and to visualize the shape
- Give at least 2 values to x to get 2 points:

$3x + 2y - 12 \leq 0$	$-x + 2y \leq 4$



Example 10: Graph the solution set for:

$$-3x + 4y - 6 \leq 0$$

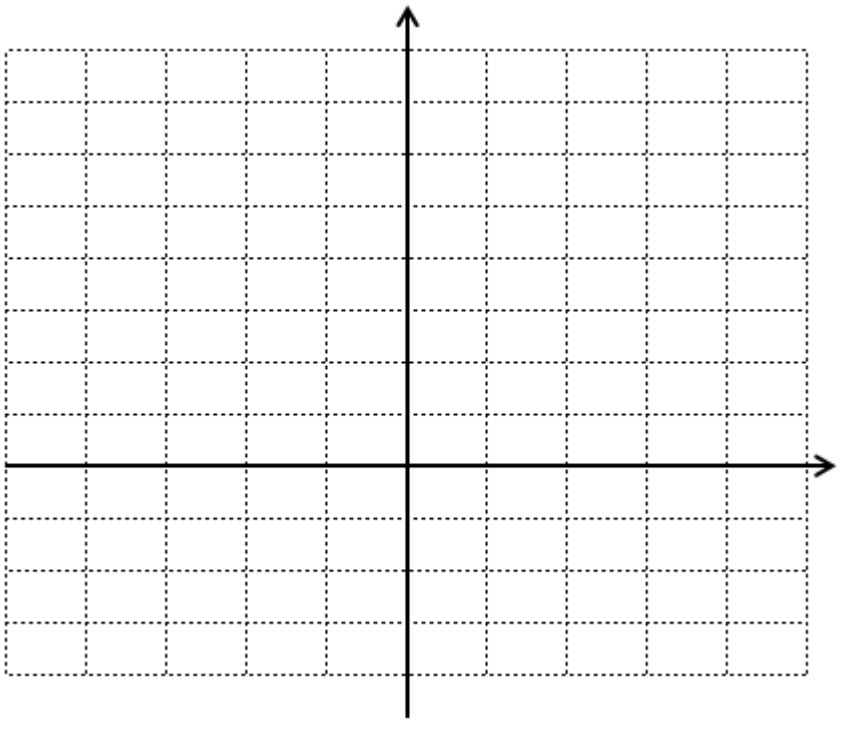
$$4x + 3y \geq 9$$

$$x \leq 4$$

$$x \geq 0,\ y \geq 0$$

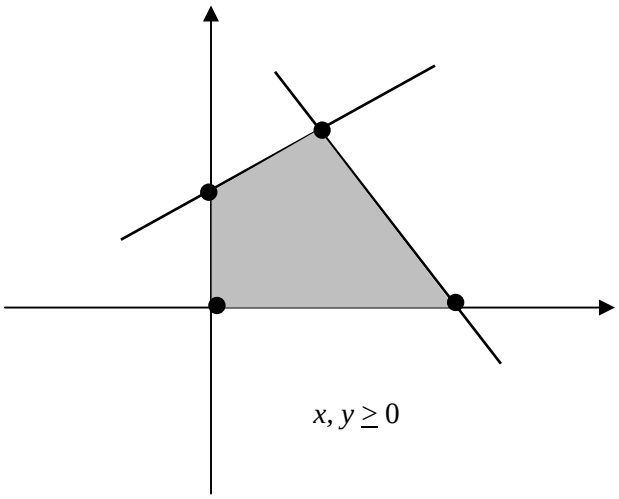
a) Find the coordinates of the corner points.

b) Maximize and Minimize $F = 2x - 4y$

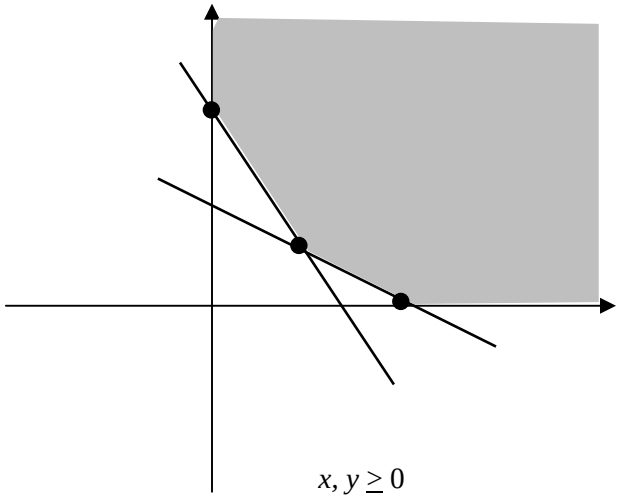


Notes:

Case 1: Bounded Solution, has Max and Min corners



Case 2: Unbounded solution, has a Min corner, but no Max.



Case 3: Unbounded solution, has a Max corner, but no Min