Lesson 3.2:

Slope

&

Equations of

Lines

Standard Form

$$Ax + By = C$$

But we like to have y by itself– it makes it easier to graph. So we solve for y.

Example 1: Solve for y

$$3x + 4y = 20$$

$$-3x \qquad -3x$$

$$\frac{4y}{4} = \frac{-3x + 20}{4}$$

$$y = -\frac{3}{4}x + 5$$

This is called

Slope - Intercept Form

$$y = f(x) = mx + b$$

Slope   y - intercept

$$\text{Slope is } \frac{\text{Rise}}{\text{Run}}$$

Rise:

~If rise is Positive, we go UP.

~If rise is Negative, we go DOWN.

Run:

~If run is Positive, we go RIGHT.

~If run is Negative, we go LEFT.
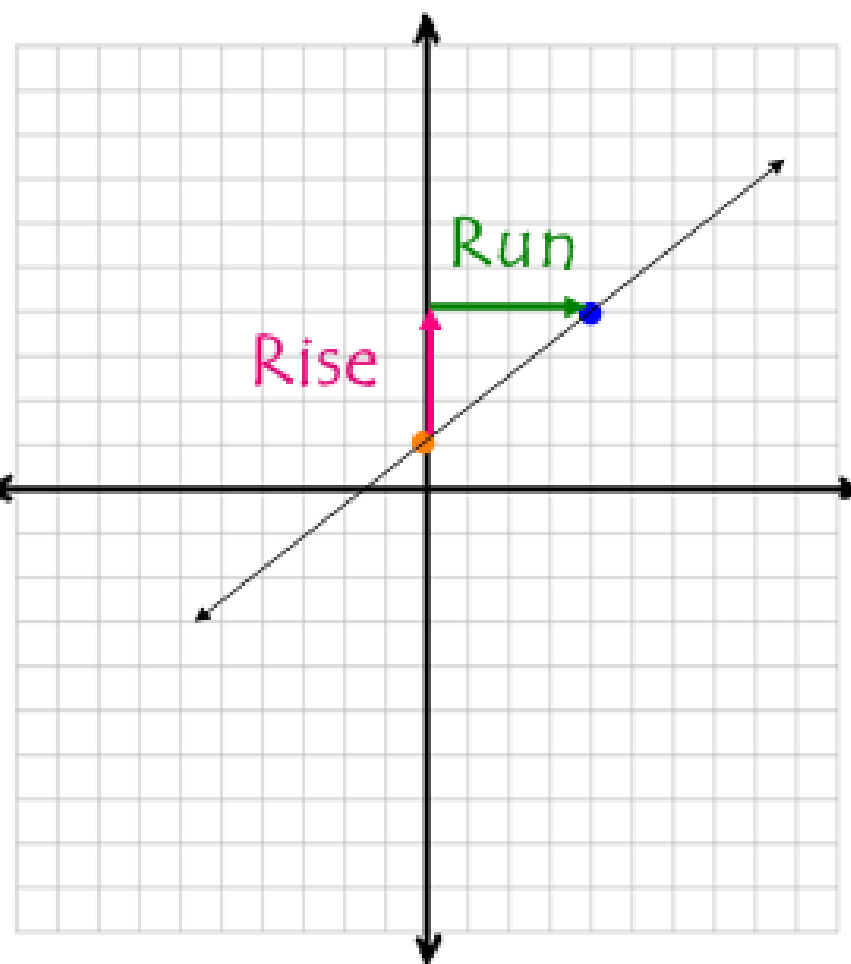
Remember:

Slope is $\dfrac{Rise}{Run}$

If: $y = \dfrac{3}{4}x + 1$ Then:

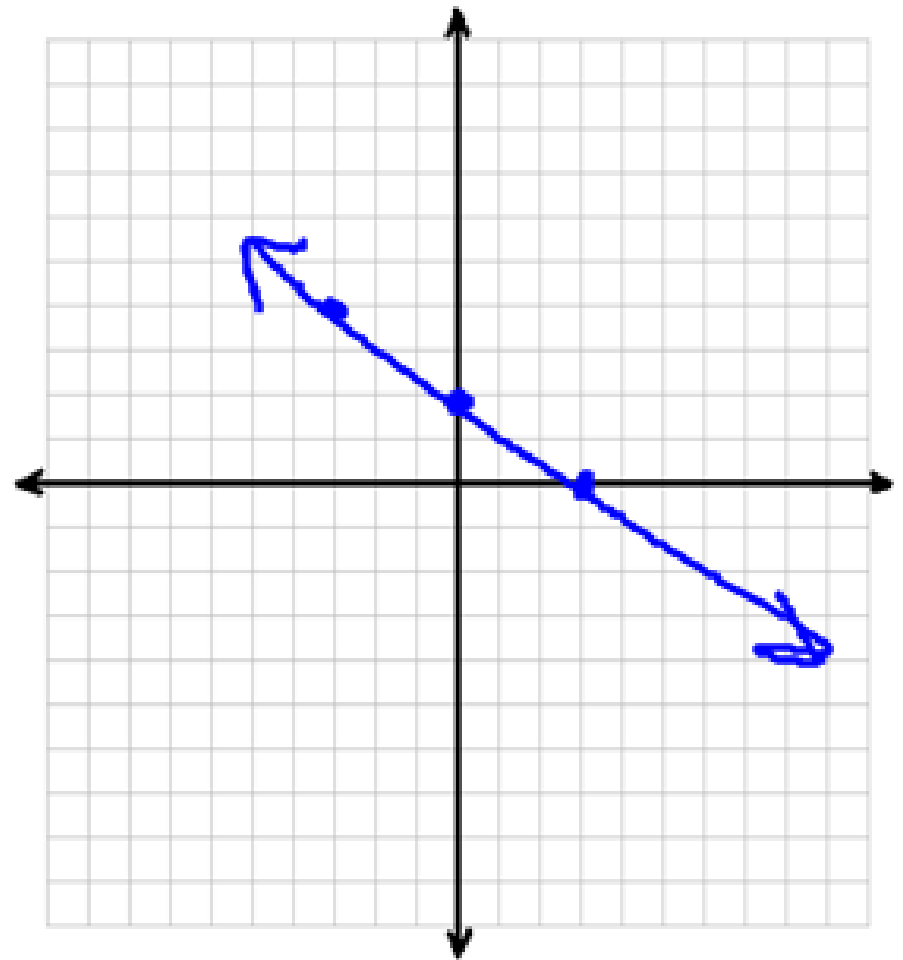Start at 1 on the y-axis and go up 3 and right 4.

$m = \dfrac{3}{4}$ $b = 1$

Run

Rise

Example 2:

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

$m = -\frac{2}{3}$

$b = 2$

Example 3: $3x + 2y = -4$

$$\underline{-3x \qquad\qquad -3x}$$

$$\frac{2y}{2} = \frac{-3x - 4}{2}$$

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

$$m = -\frac{3}{2}$$

$$b = -2$$
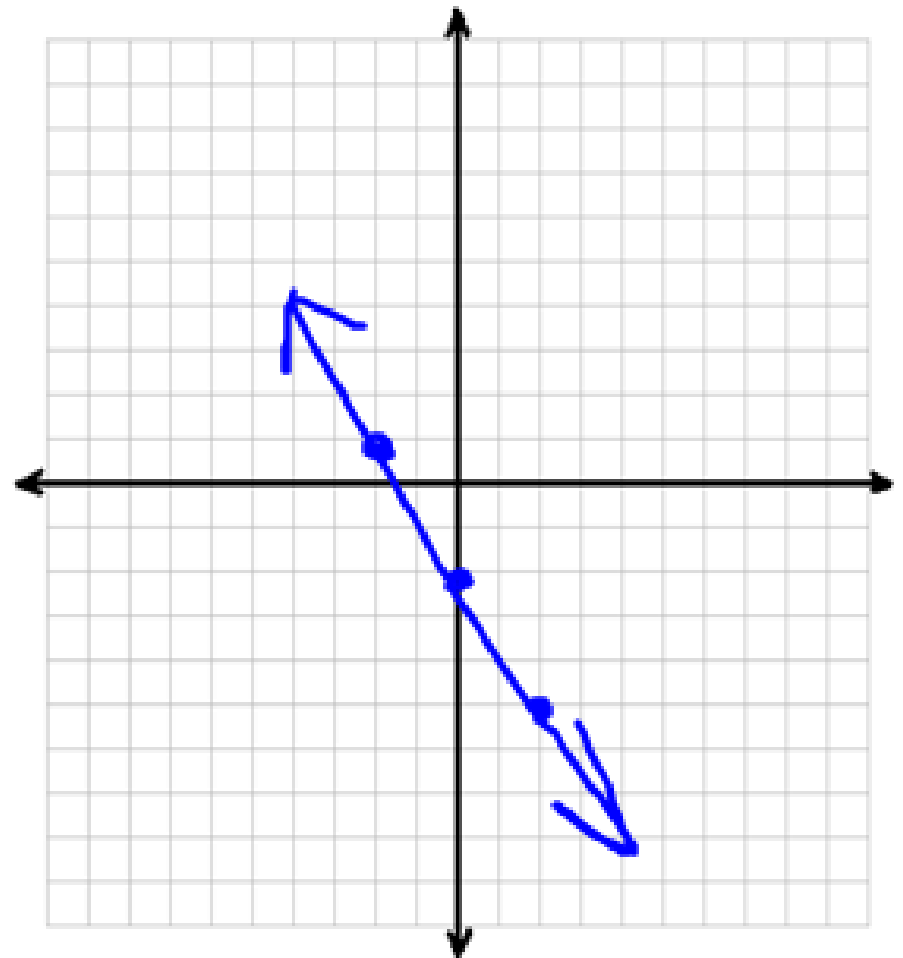
Example 4: Write the Equation of the line in the graph. (Hint: Identify the slope and the y-intercept.)

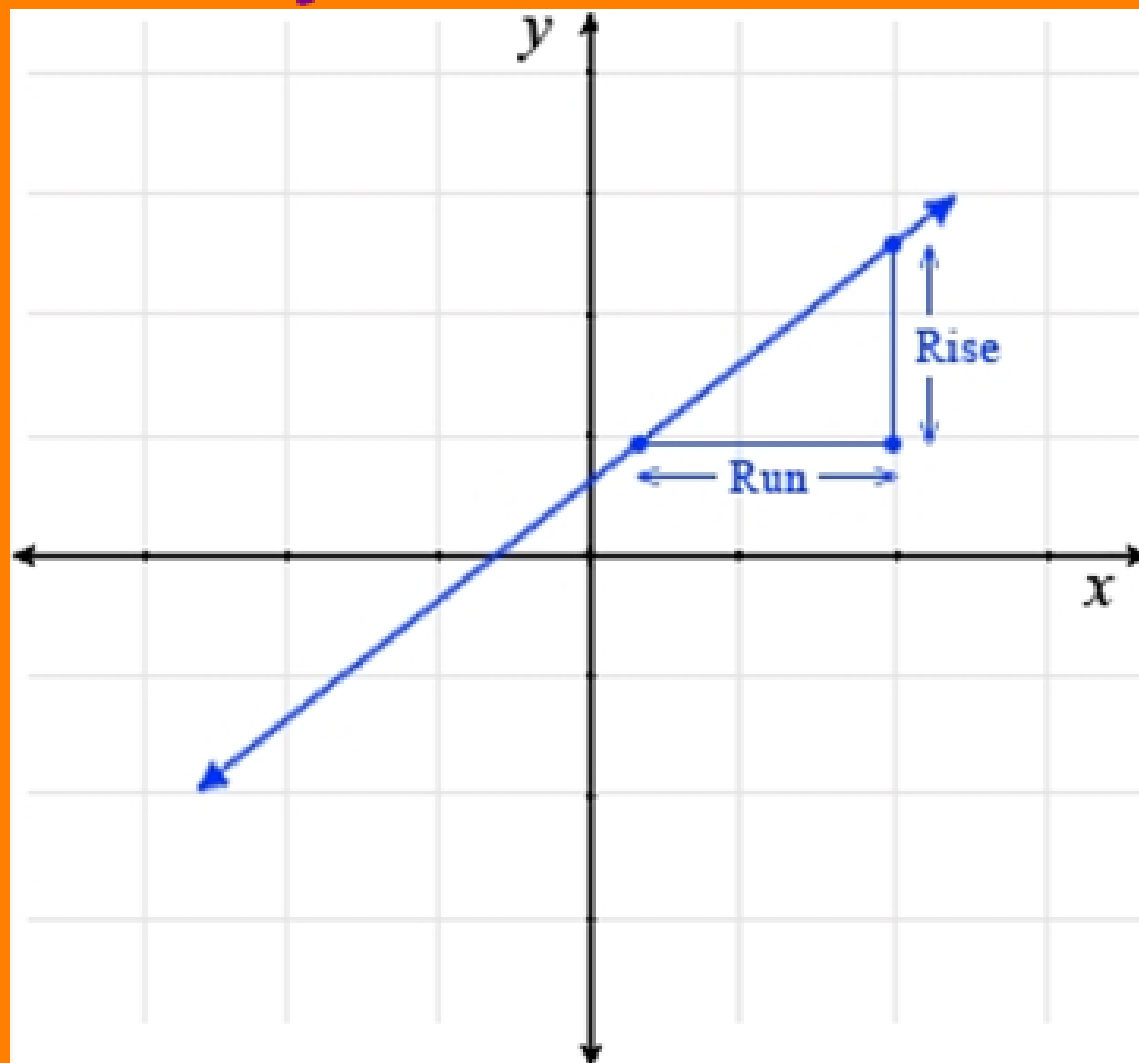$b = -2$

$y = \underset{\uparrow}{m} x + \underset{\uparrow}{b}$

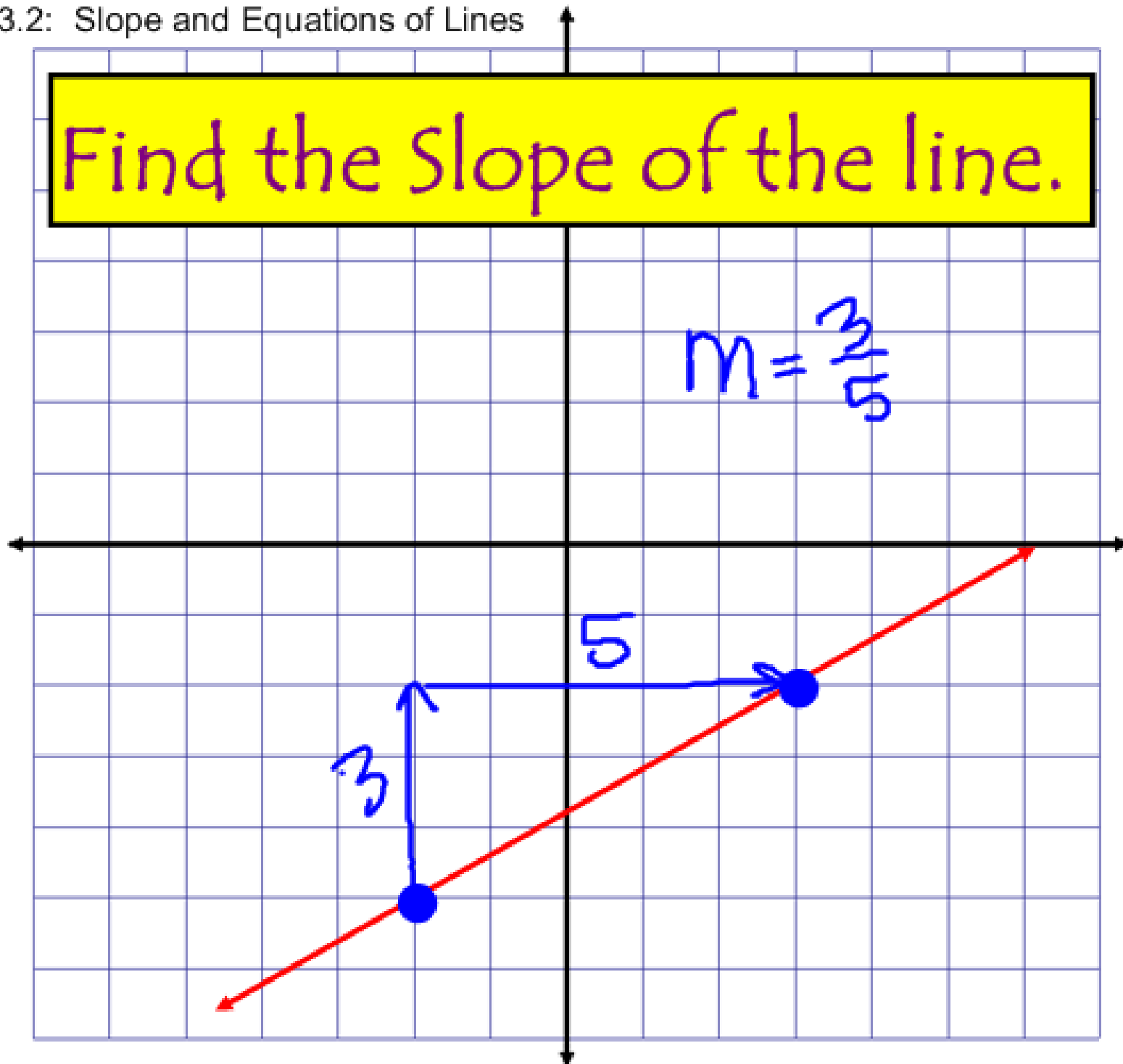$m = \dfrac{3}{2}$

$y = \dfrac{3}{2} x - 2$
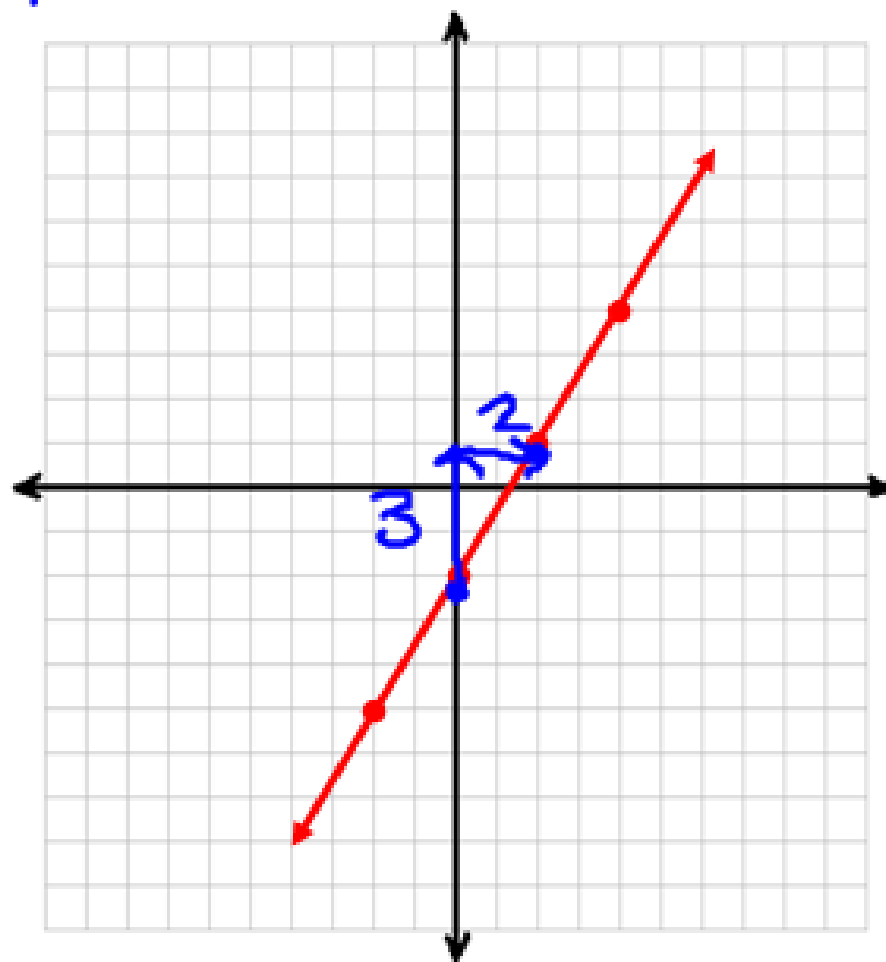
Slope!

Rise
Run

$$Slope = m$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{Rise}{Run} \qquad m = \frac{y2 - y1}{x2 - x1}$$

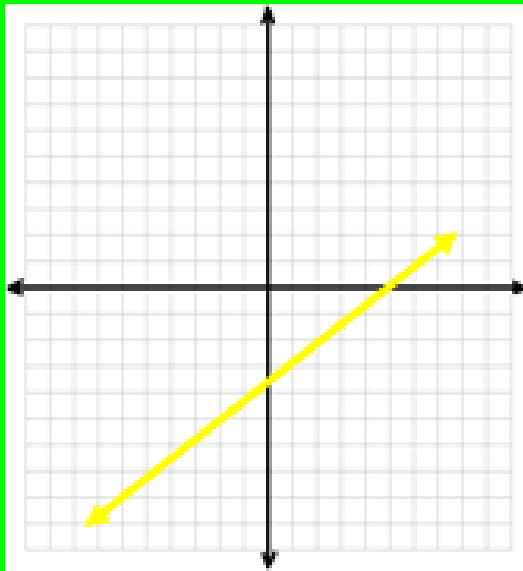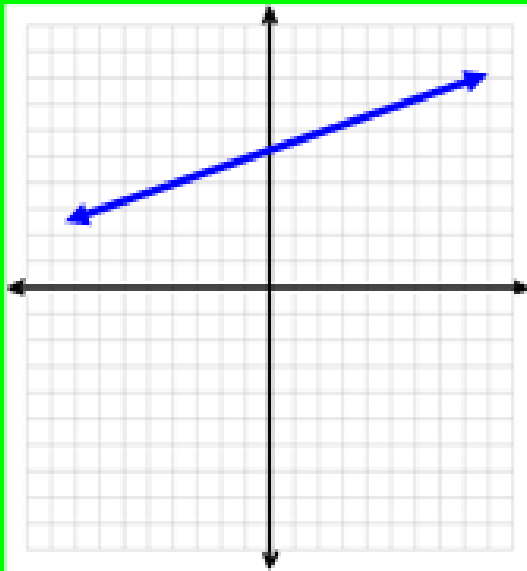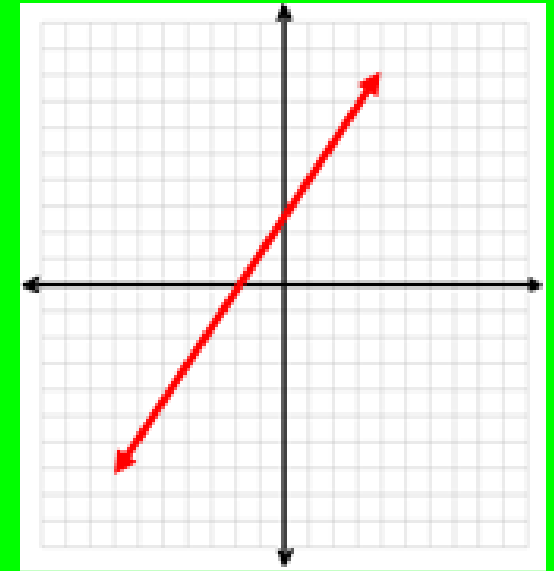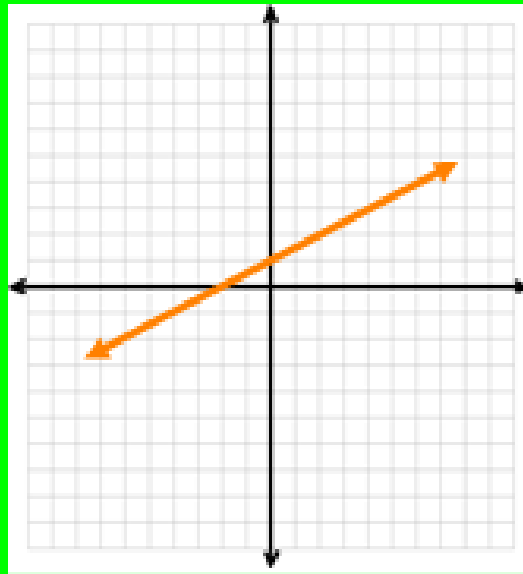**Find the Slope of the line.**

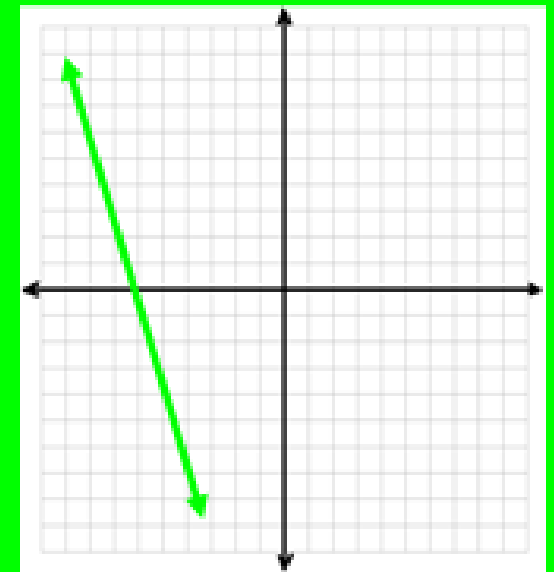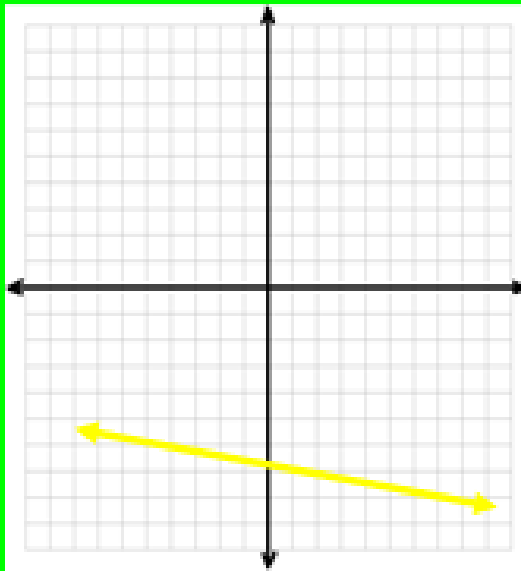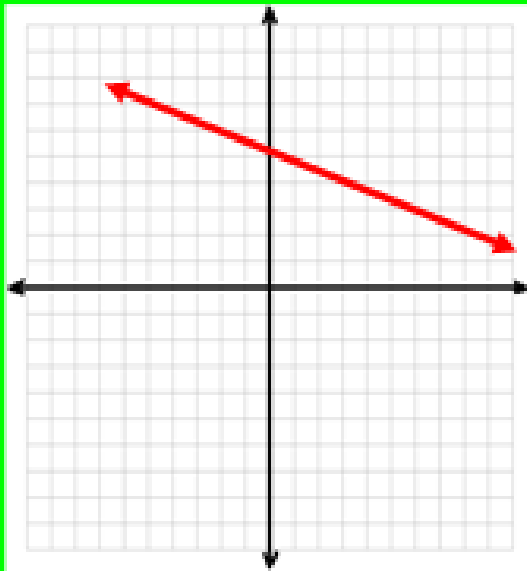$$m = \frac{3}{5}$$

5

3

Postitive Slope Graphs

$m > 0$
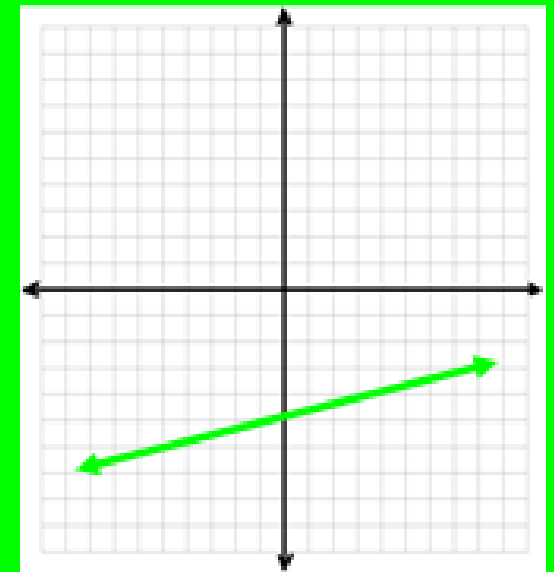
Negative Slope Graphs

$m < 0$
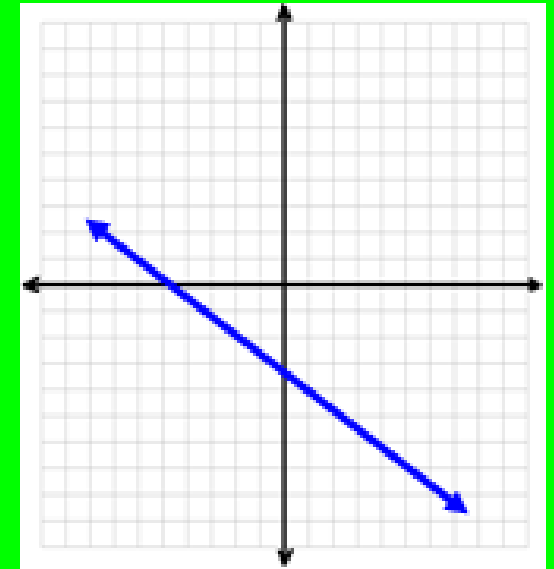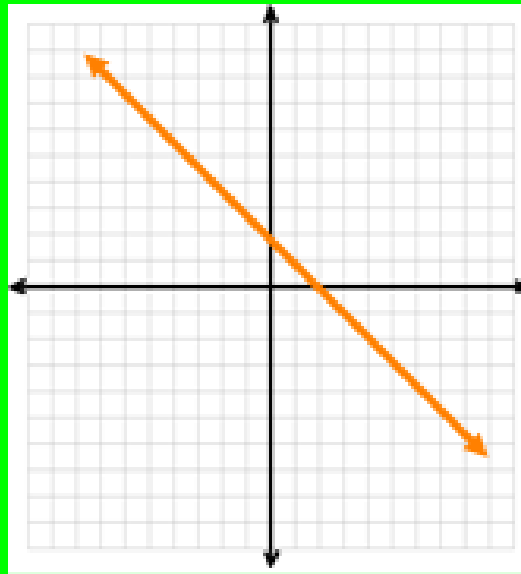
Slope=0 Graphs

$m=0$ (horizontal)
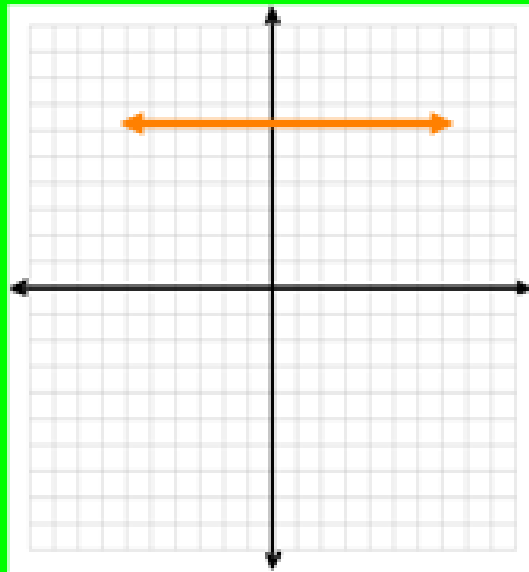
$$m = \frac{0}{6} = 0$$
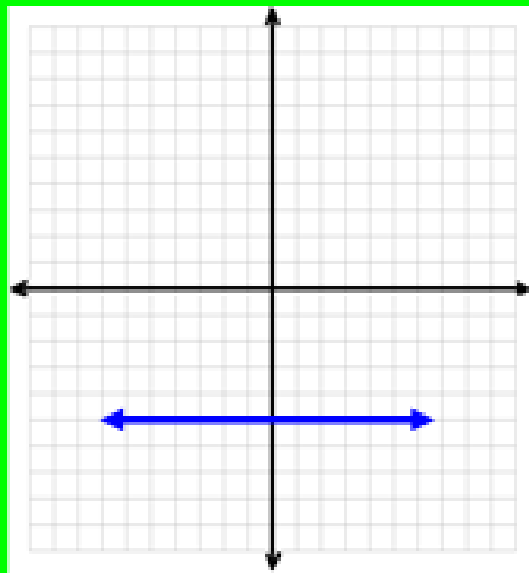
~~No Slope~~ Graphs
(Undefined Slope)

$$m = \frac{6}{0}$$

m=undef.

Vertical
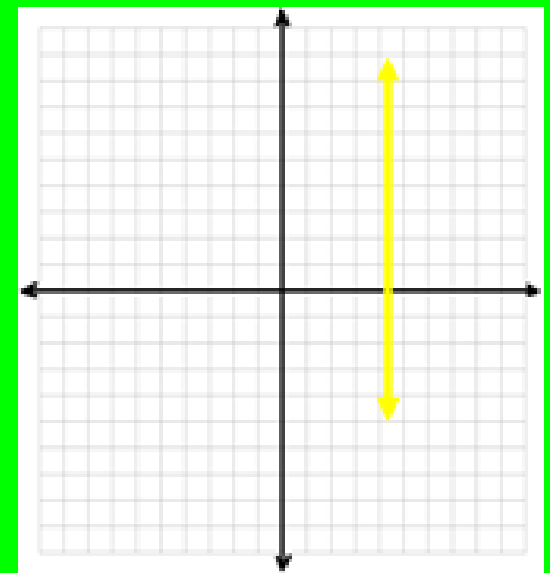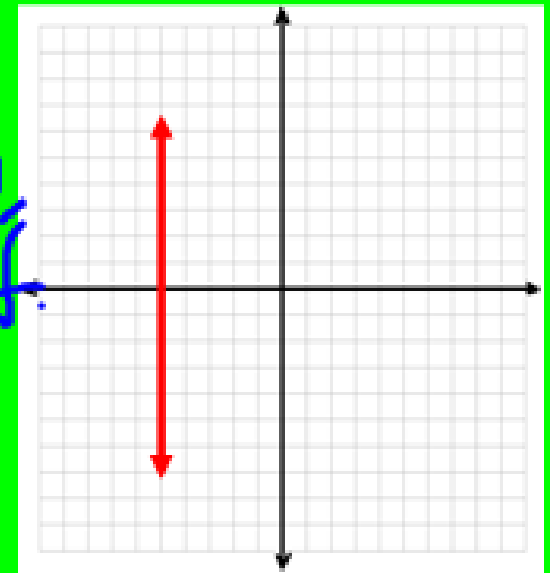
Example 5: Find the Slope of the line that passes through the points $(\overset{x_1}{3}, \overset{y_1}{4})$ and $(\overset{y_2}{6}, \overset{y_2}{-8})$.

Use formula!

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-8 - 4}{6 - 3} = \frac{-12}{3} = \frac{-4}{1}$$

$$\boxed{m = -4}$$

Example 6: Find the Slope of the line that passes through the points (1, 2) and (-3, -7).

$$m = \frac{-7-2}{-3-1} = \frac{-9}{-4} = \boxed{m = \frac{9}{4}}$$

$x_1 \; y_1 \qquad x_2 \; y_2$

Example 7: Find the Slope of the line that passes through the points (-2,-4) and (-4, -8).
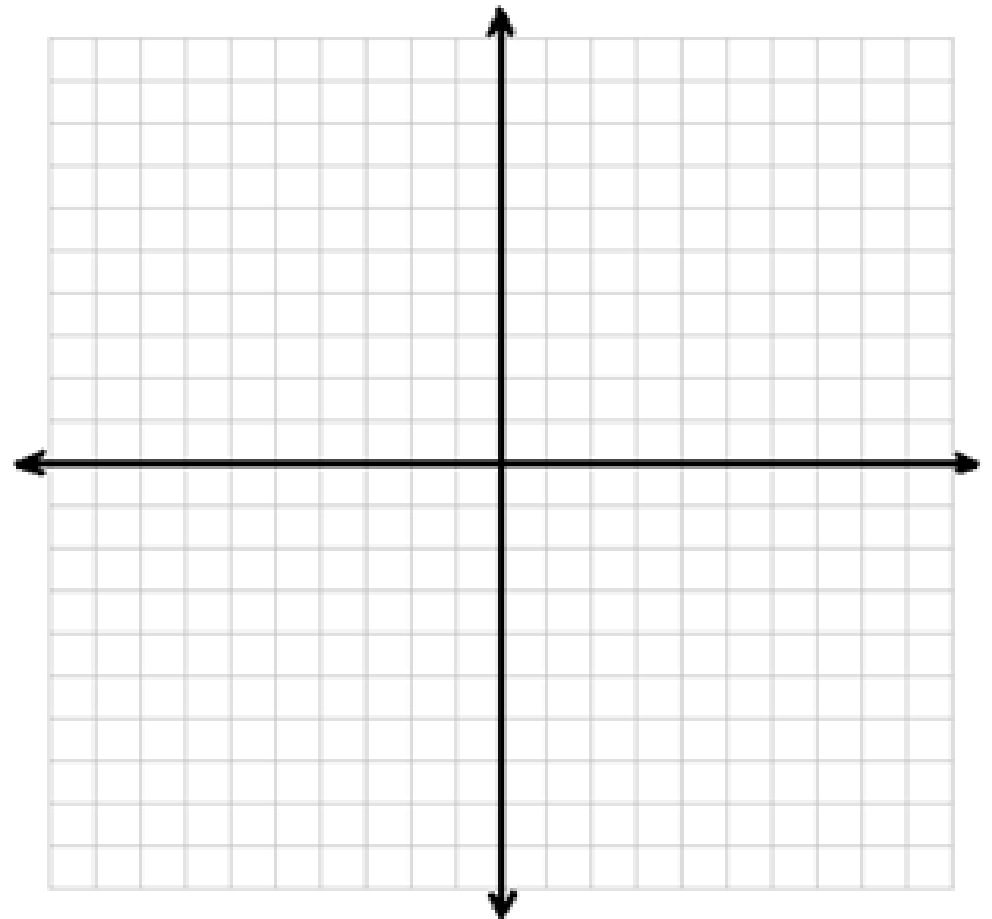
We always want our equations to be in Slope-Intercept Form so we can graph them easier, but sometimes we are not given the information we need. So we have another form that we can use to help us get our equation into Slope-Intercept Form.

It is called Point-Slope Form.

Point-Slope Form

Point-Slope form uses a point and the slope to create a linear equation.

$$(x1, y1) \text{ and } m$$

$$y - y1 = m(x - x1)$$

Example 8: What is the equation of the line that has slope of 3 and goes through $(\overset{x_1}{3}, \overset{y_1}{5})$?   Point slope

Solve for "b".

$m = 3$

$y - 5 = 3(x - 3)$

$y - 5 = 3x - 9$
$ + 5 + 5$

$\boxed{y = 3x - 4}$

$m = 3$

$y = 3x + b$ $\boxed{y = 3x - 4}$

$5 = 3(3) + b$

$5 = 9 + b$
$-9 -9$

$\boxed{-4 = b}$

Example 9: What is the equation of the line that goes through $(-2, 3)$ and $(1, -1)$?

$\underbrace{\quad}_{x_1 \quad y_1} \qquad \underbrace{\quad}_{x_2 \quad y_2}$

Hint: Find the Slope first.

$$m = \frac{-1-3}{1++2} = \frac{-4}{3}$$

$$y-+1 = -\frac{4}{3}(x-1)$$

$$y+1 = -\frac{4}{3}x + \frac{4}{3} - \frac{1\cdot3}{1\cdot3}$$
$$\underline{\;-1\;}$$

$$y = -\frac{4}{3}x + \frac{4}{3} - \frac{3}{3}$$

$$\boxed{y = -\frac{4}{3}x + \frac{1}{3}}$$
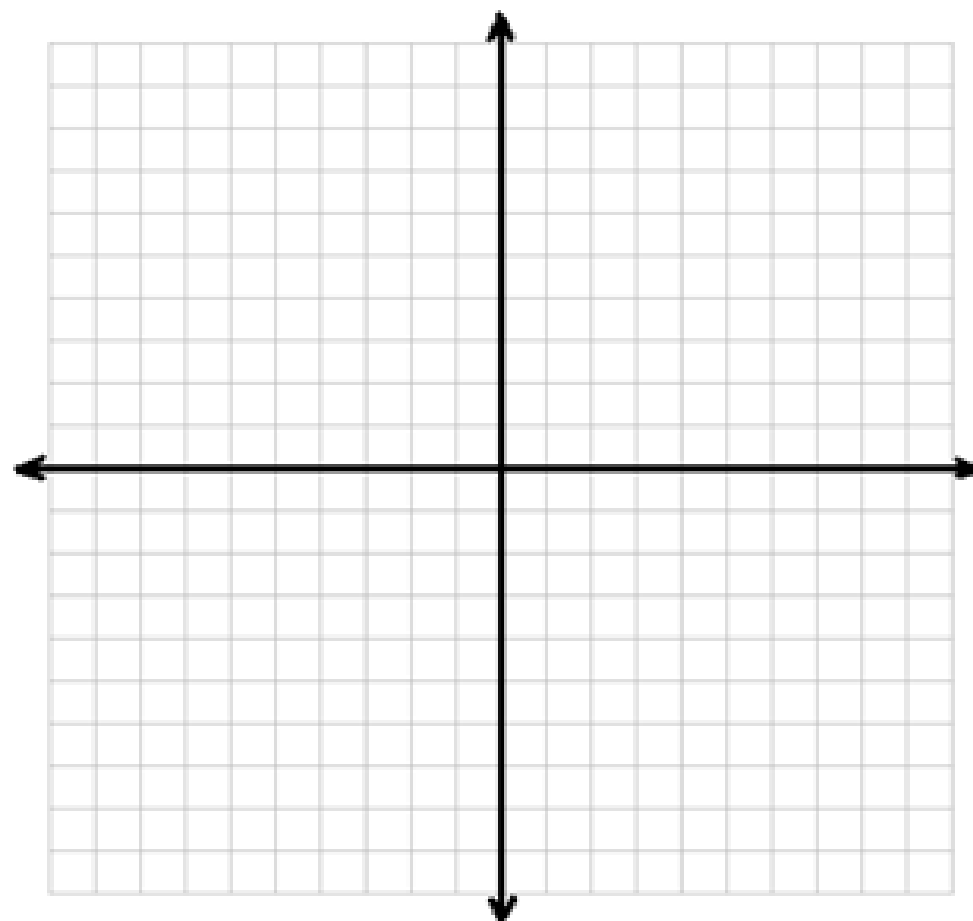
Example 10: Find a linear function, f, such that $f(2)=7$ and $f(3) = 4$. What is f(5)?

Hint: Find the Slope first.

$(2, 7)$　　　$(3, 4)$
$x_1\ y_1$　　　$x_2\ y_2$

$m = \dfrac{4-7}{3-2} = \dfrac{-3}{1}$

$m = -3$

$y = -3x + b$

$4 = -3(3) + b$

$4 = -9 + b$

$+9 \quad +9$

$b = 13$

$y = -3x + 13$

$\boxed{f(x) = -3x + 13}$

$f(5) = -3(5) + 13$

$= -15 + 13$

$= -2$

$\boxed{f(5) = -2}$

Review!

Example 11: Write the Equation of the line that has slope -2 and y-intercept of 5.

$$y = -2x + 5$$
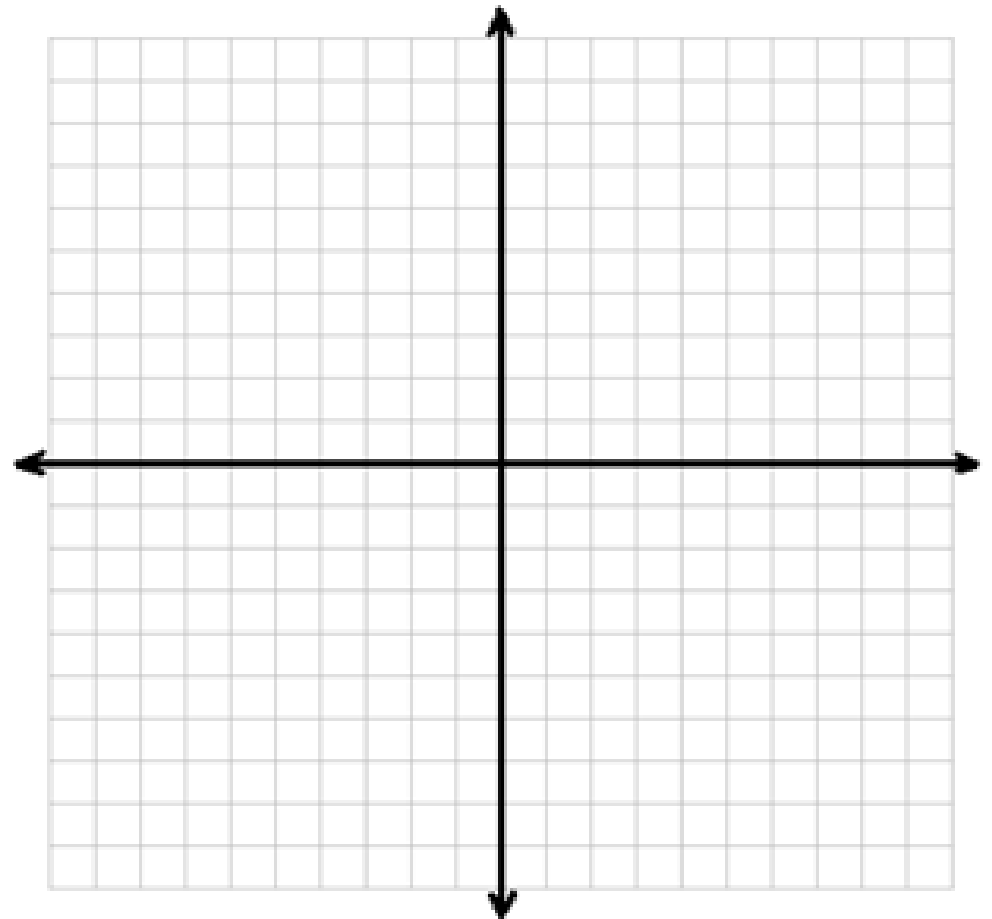
Example 12: Find the X and Y intercepts of the following equation and then graph.
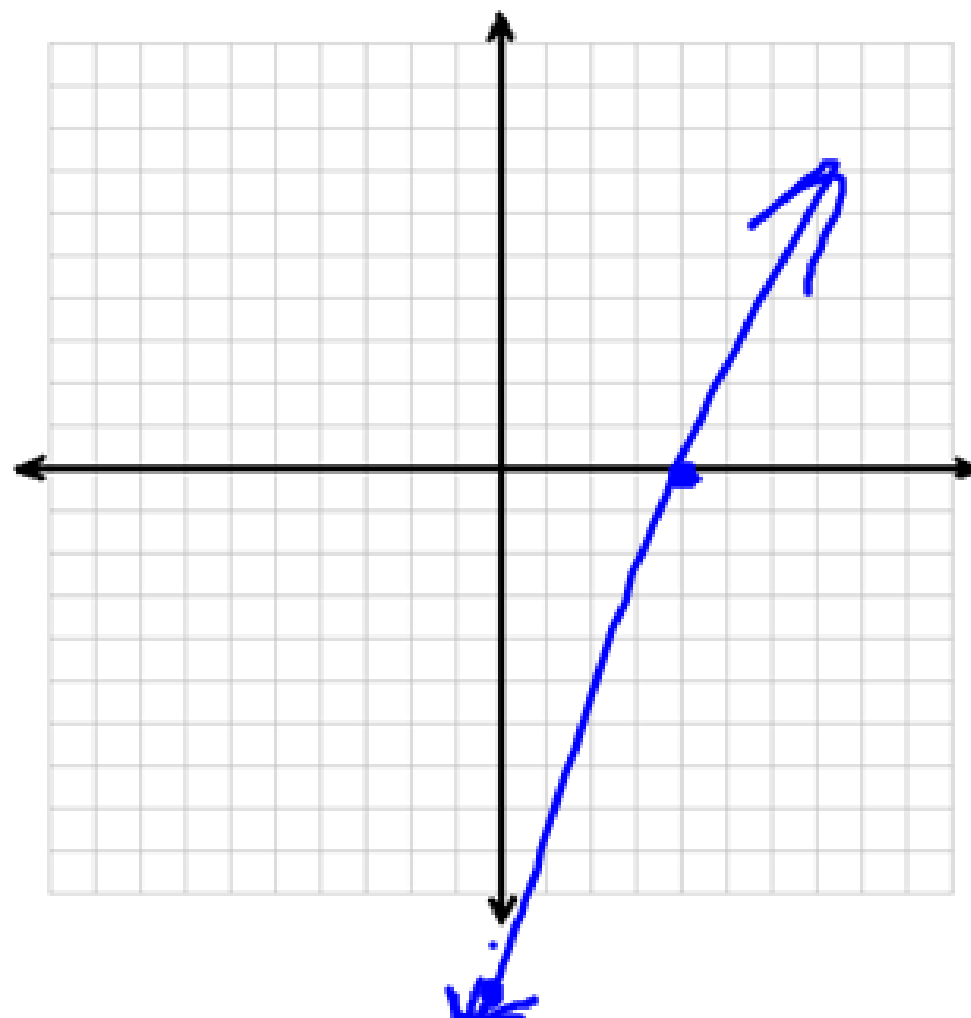
$$3x - y = 12$$

X-int: $(4, 0)$

$3x = 12$

$x = 4$

y-int: $(0, -12)$

$-y = 12$

$y = -12$

Homework:

Pg. 210–215:
#'s 1–12 all, 13, 15, 23, 25,
29, 33, 39, 43, 47, 51, 61, 67,
77, 83, 89, 95