Math 9 – Analytic Geometry Name: Mr. Hagen

Lesson #1: Slope Intercept Form (part 1) Date: March 20, 2018

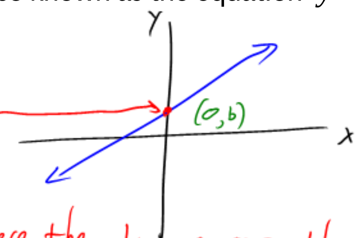
Now that we have looked at the fundamentals of Coordinate Geometry (plotting points, graphing lines and calculating slope), we are now going turn our focus to analyzing lines, dissecting information, and making decisions on how to create equations. All the skills that you learned in Coordinate Geometry are essential to this unit.

In Analytic Geometry, we will learn about:

- two forms/equations to represent a line (and how to graph, create and use them)
- a third equation which will help us derive the first two
- x and y intercepts
- intersecting lines
- parallel and perpendicular slopes/lines

Today, we will learn about the all-powerful **Slope Intercept Form**, also known as the equation $y = mx + b$.

Let's break down the equation.



$$y = mx + b$$

$b \rightarrow$ y-intercept

↳ where the line crosses the y-axis

↳ the x is always 0

$m \rightarrow$ slope

$y, x \rightarrow$ (x, y) a point on a graph

Example One – State the slope and y-intercept

$y = mx + b$

a) $y = \frac{3}{4}x - 7$

$m = \frac{3}{4}$

$b = -7$ $(0, -7)$

b) $4x - 2y = -10$

$+2y$ $+2y$

$+10$ $+10$

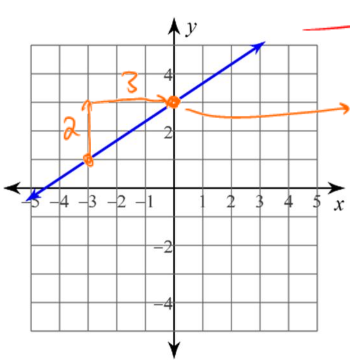
$$\frac{4x}{2} + \frac{10}{2} = \frac{2y}{2}$$

$$y = \underset{m}{\boxed{2}}x \underset{b}{\boxed{+5}}$$

$m = 2$

$b = 5$ $(0, 5)$

c)



y-int

$m = \frac{Rise}{Run}$

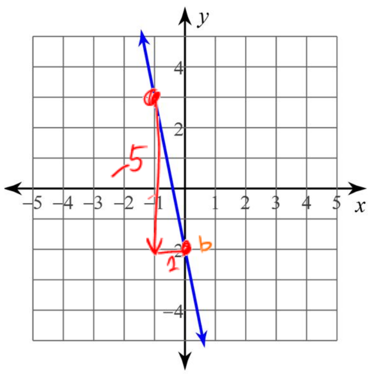
$m = \frac{2}{3}$

$b = 3$ $(0, 3)$

Whoah! Wait a minute. In c), we looked at the graph and determined the slope and the y-intercept. Since the equation of a line is $y = mx + b$ with m = *slope* and b = *y-int*, what would the equation of line to c) be?

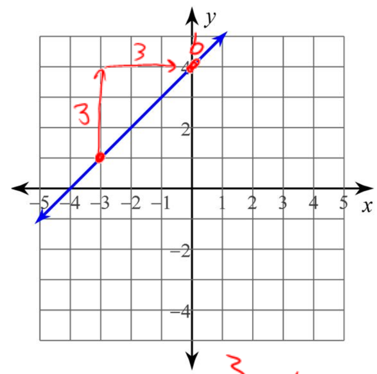
$$y = \frac{2}{3}x + 3$$

Example Two: Determine the equation of line.



$$y = \boxed{m}x \boxed{+b}$$

$$y = -5x - 2$$



$$y = mx + b$$

$$y = 1x + 4$$

$$m = \frac{3}{3} = 1$$

Graphing Lines: The power of $y = mx + b$ comes with graphing. No longer do we have to make a table of values, instead we will use the properties of the equation. What makes this process amazingly exciting is that it is super duper fast.

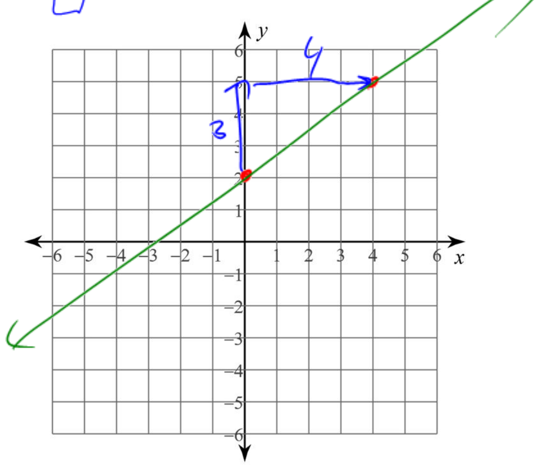
Step 1: Turn into $y = mx + b$ if it is not already.

Step 2: Plot the y-intercept

Step 3: From the y-intercept, use your slope (rise over run) to find the next point. (repeat if needed)

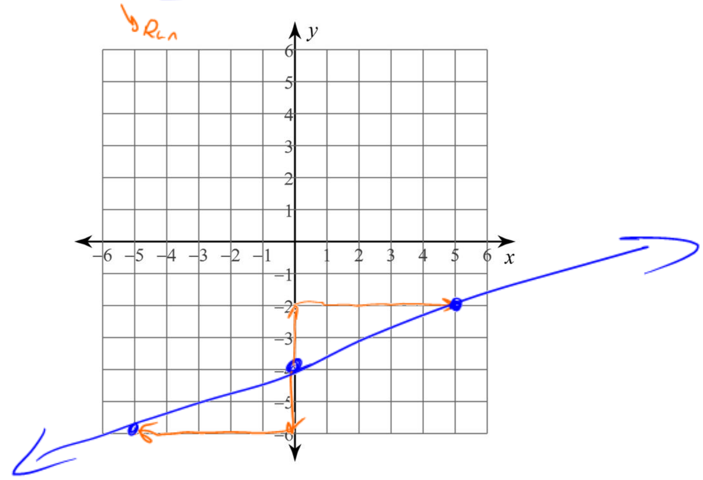
Step 4: Draw the line.

$$y = \underbrace{\boxed{\frac{3}{4}}}_{m}x \underbrace{\boxed{+2}}_{b}$$



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

Rise / Run

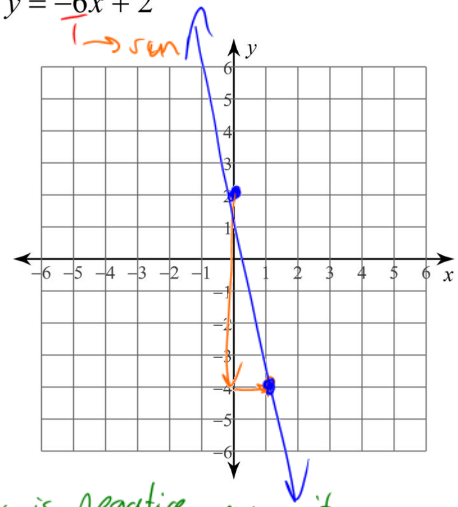


rise

b

$y = -6x + 2$

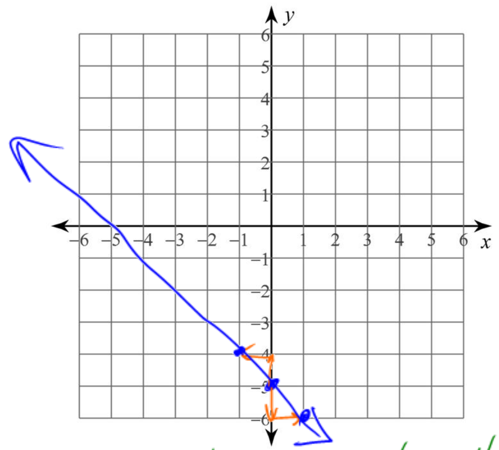
1 → run



$m = \frac{-1}{1}$

b

$y = -x \boxed{-5}$



If y is negative, move it.

If y is positive, move the other stuff away.

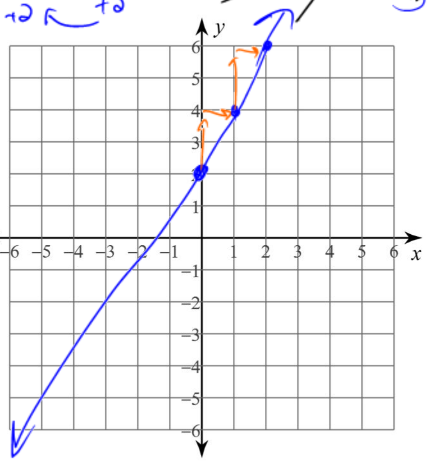
+y +y

+2 +2

$2x - y = -2 \implies y = \boxed{2}x \boxed{+2}$

m b

$m = \frac{2}{1}$ rise / run



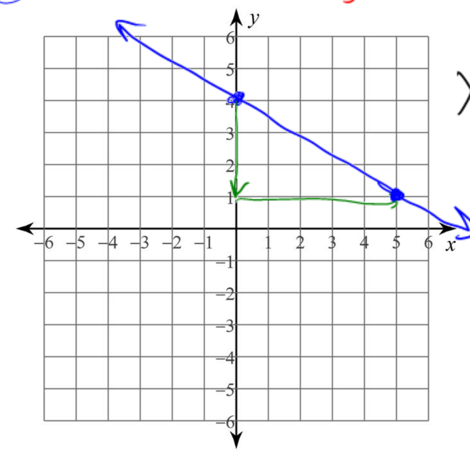
-3x -3x

$3x + 5y = 20 \implies \frac{5y}{5} = \frac{-3x}{5} + \frac{20}{5}$

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

b

$m = \frac{-3}{5}$ – Rise / – run



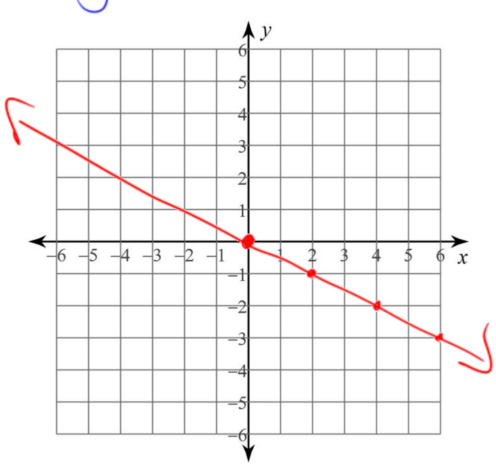
$-\frac{1}{2}x$ $-\frac{1}{2}x$

$y + \frac{1}{2}x = 0 \implies y = -\frac{1}{2}x \boxed{+0}$

b

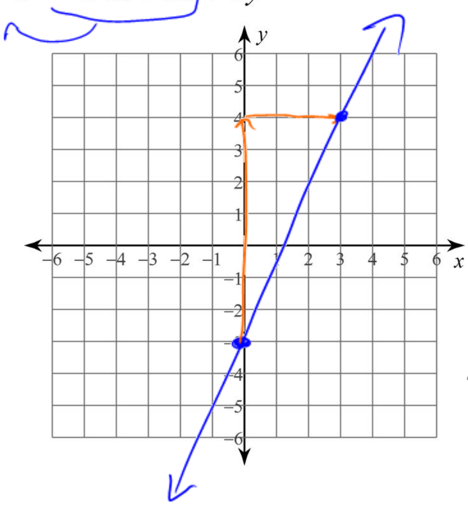
$b = 0$

$m = \frac{-1}{2}$ – rise / – run



+14x −18

$0 = \boxed{-14x + 18} + 6y$



$14x - 18 = 6y$

$\frac{6y}{6} = \frac{14x}{6} - \frac{18}{6}$

$y = \frac{7}{3}x \underbrace{-3}_{b}$