

Review of Linear Equations

$$y = 2x + 5$$

$$y = -5x + 1$$

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

$$3x + 4y = 7$$

→ All of these are linear equations. A graph of y vs x would be linear.

→ These equations are all in slope-intercept form or:

$$y = mx + b$$

Recall

slope: $m = \frac{\text{rise}}{\text{run}}$

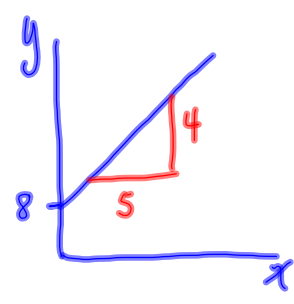
m is the slope
b is the y-intercept

$$m = \frac{\Delta y}{\Delta x} \begin{matrix} \text{(change in y)} \\ \text{(change in x)} \end{matrix}$$

Δ = "change in"
↑
delta (greek letter)

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

y-intercept: the value of y when $x = 0$
(Where the graph crosses the y-axis)



slope: $m = \frac{4}{5}$

y-int: $b = 8$

$$y = mx + b$$

$$y = \left(\frac{4}{5}\right)x + (8)$$

↑ m ↑ b

Example

slope of $\frac{2}{3}$

rise = 2, run = 3

every time the x-value is increased by 3, the y-value increases by 2.

Slope of $-\frac{1}{2}$

rise = -1, run = 2

when x ↑ by 2, y ↓ by 1

$(\frac{1}{-2}$ and $-\frac{1}{2})$
Same

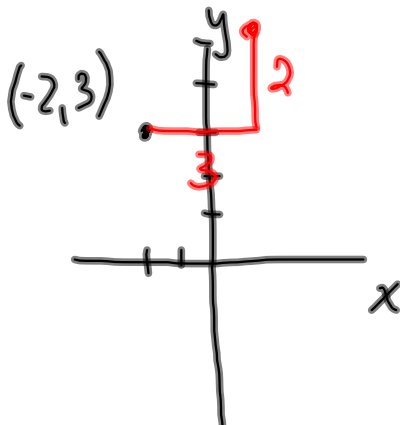
Slope of $\frac{5}{1}$

rise = 5, run = 1

when x ↑ by 1, y ↑ by 5

Example

What is a point that a line with a slope of $\frac{2}{3}$ will pass through if it also passes through $(-2, 3)$?



x: $-2 + 3 = +1$

y: $3 + 2 = +5$

$(1, 5)$

(x, y)

Sketching a Graph

Example Graph $2x + 5y = 20$ (this is NOT in slope-intercept form)

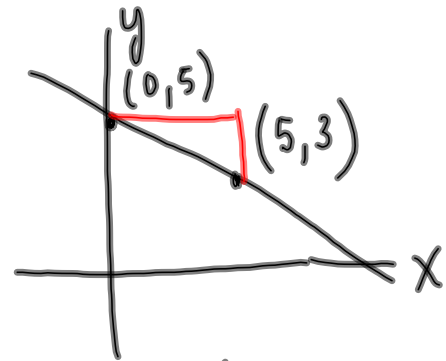
Method #1 (slope-intercept form)

$$2x + 5y = 20$$

$$5y = -2x + 20$$

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

slope: $m = -\frac{2}{5}$
 y-int: $b = 4$



METHOD 2 (x+y intercepts)

$$2x + 5y = 20$$

x-intercept (let $y=0$):

y-intercept (let $x=0$):

$$2x + 5(0) = 20$$

$$2x = 20$$

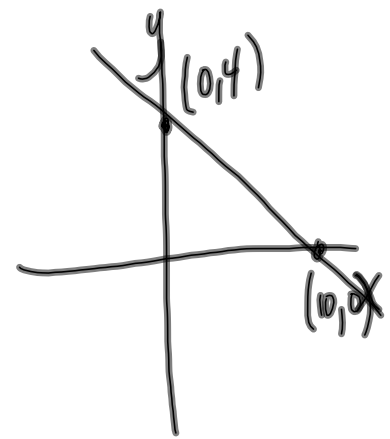
$$x = 10$$

$$2x + 5y = 20$$

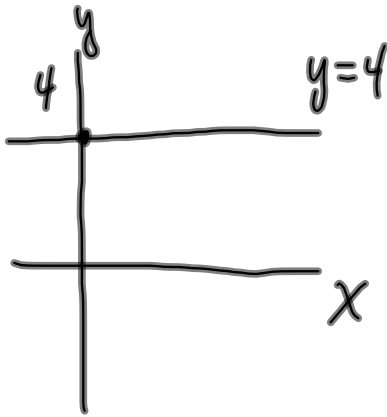
$$\cancel{2(0)} + 5y = 20$$

$$5y = 20$$

$$y = 4$$



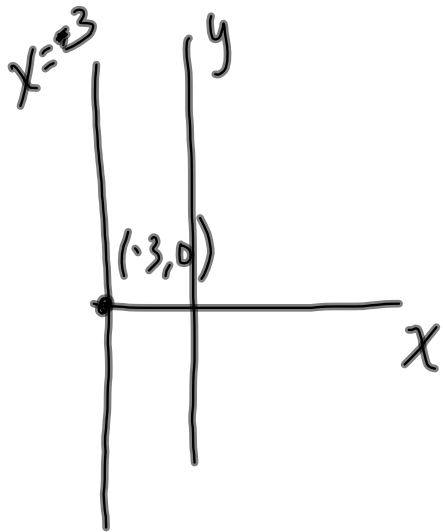
What about $y = 4$?



← there is a y-int but no slope
(slope = 0)

This is still a linear eq.

What about $x = -3$?



← x-intercept is -3 , but there is no y-intercept
Slope is undefined

This is still a linear eq.

Example

Find the equation of a line that passes through $(2, 5)$ and has a slope of 3.

(x, y)

← ???

$$y = mx + b$$

$$5 = 3(2) + b$$

$$5 = 6 + b$$

$$b = 5 - 6$$

$$b = -1$$

$$y = mx + b$$

$$y = 3x - 1$$

Example Find the equation of the line passing through $(2, 6)$ and $(-1, 8)$.

x_1, y_1

x_2, y_2

Find the slope: $m = \frac{\Delta y}{\Delta x}$

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

$$m = \frac{8 - 6}{-1 - 2}$$

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

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

$$y = mx + b$$

$$6 = -\frac{2}{3}(2) + b$$

$$6 = -\frac{4}{3} + b$$

$$b = 6 + \frac{4}{3}$$

$$b = \frac{18}{3} + \frac{4}{3}$$

$$b = \frac{22}{3}$$

$$y = mx + b$$

$$y = -\frac{2}{3}x + \frac{22}{3}$$

Example Find the equation of a line with an x -intercept of -4 and a y -intercept of 2 .

$(-4, 0)$ $(0, 2)$

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

$$m = \frac{2 - 0}{0 - (-4)}$$
$$m = \frac{2}{4} = \frac{1}{2}$$

$$y = mx + b$$
$$y = \frac{1}{2}x + 2$$