Solve linear Equations by Graphing

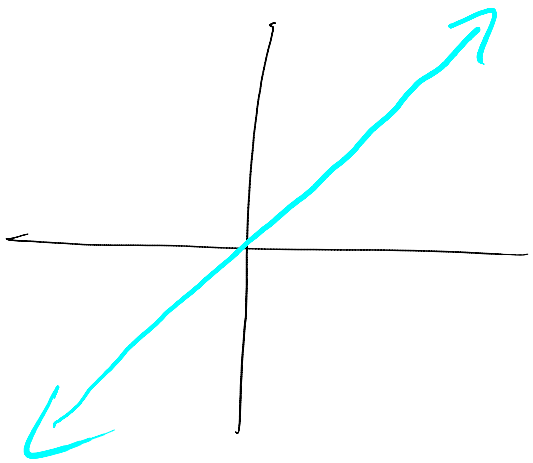
(it's easier to solve algebraically)

Parent Functions

- simplist form of a function

- Linear

$$y = x$$



Parent: $f(x) = x$

Shape: line

Domain: $\mathbb{R}$ $(-\infty, \infty)$

Range: $\mathbb{R}$ $(-\infty, \infty)$

Solutions (or roots) of an equation is any value that makes the equation true.

- Linear equations can have AT MOST one root

- Values of x for which $f(x) = 0$ are called zeros.

↳ Graphically zeros are x-intercepts

Ex: $y = 2x - 8$. Find the zero.

Solve $0 = 2x - 8$

$$\boxed{x = 4}$$

Notations:

4 is the x-intercept of $y = 2x - 8$

4 is the solution of $0 = 2x - 8$

4 is the root of $0 = 2x - 8$

4 is the zero of $f(x) = 2x - 8$

Forms of Linear Equations

① Standard Form: $Ax + By = C$

② Point-Slope Form

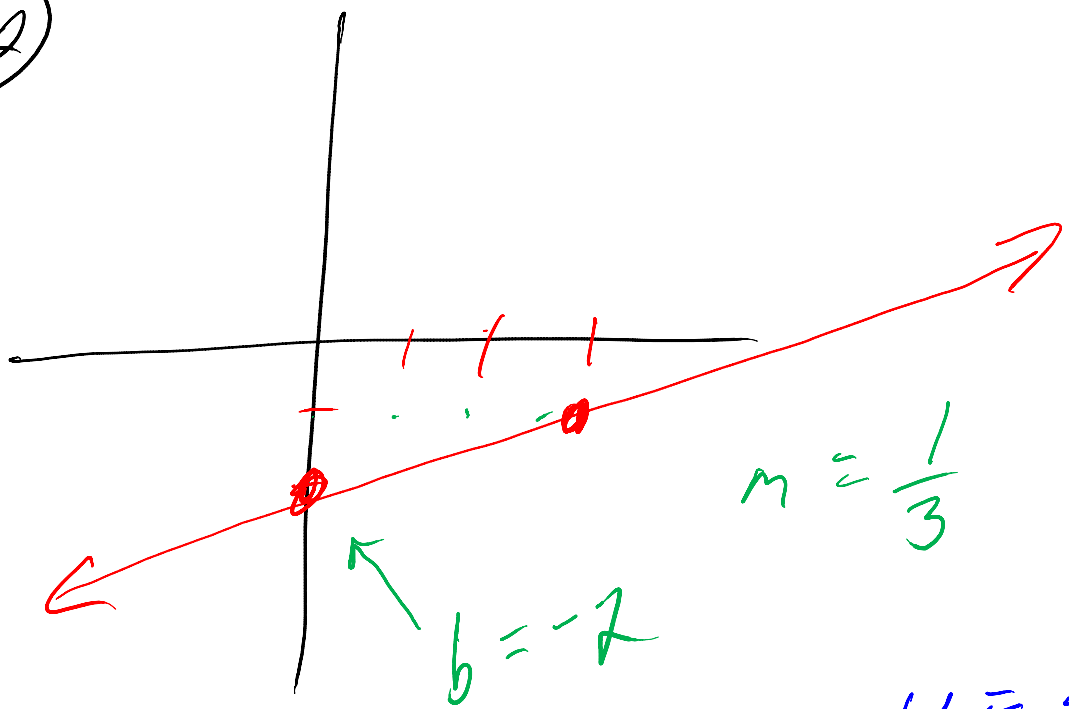
③ Slope-Intercept Form

$$y = mx + b$$

y-coord slope y-coord y-intercept

① $m = -\frac{2}{3}$ $(0, 5)$ $\rightarrow$ $y = -\frac{2}{3}x + 5$

②

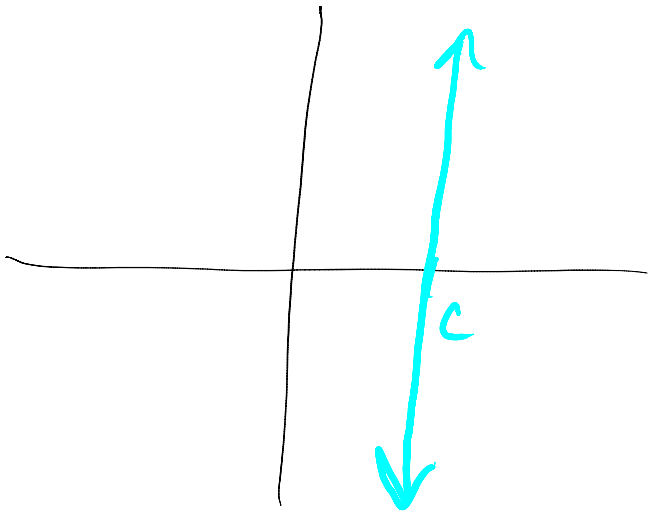


$y = \frac{1}{3}x - 2$

Vertical Lines (VUX)

- slope is undefined

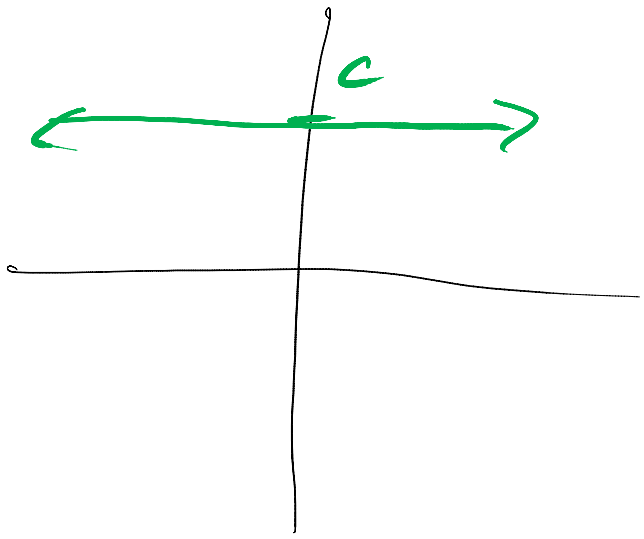
- $x = c$



Horizontal Lines HOY

- slope = 0

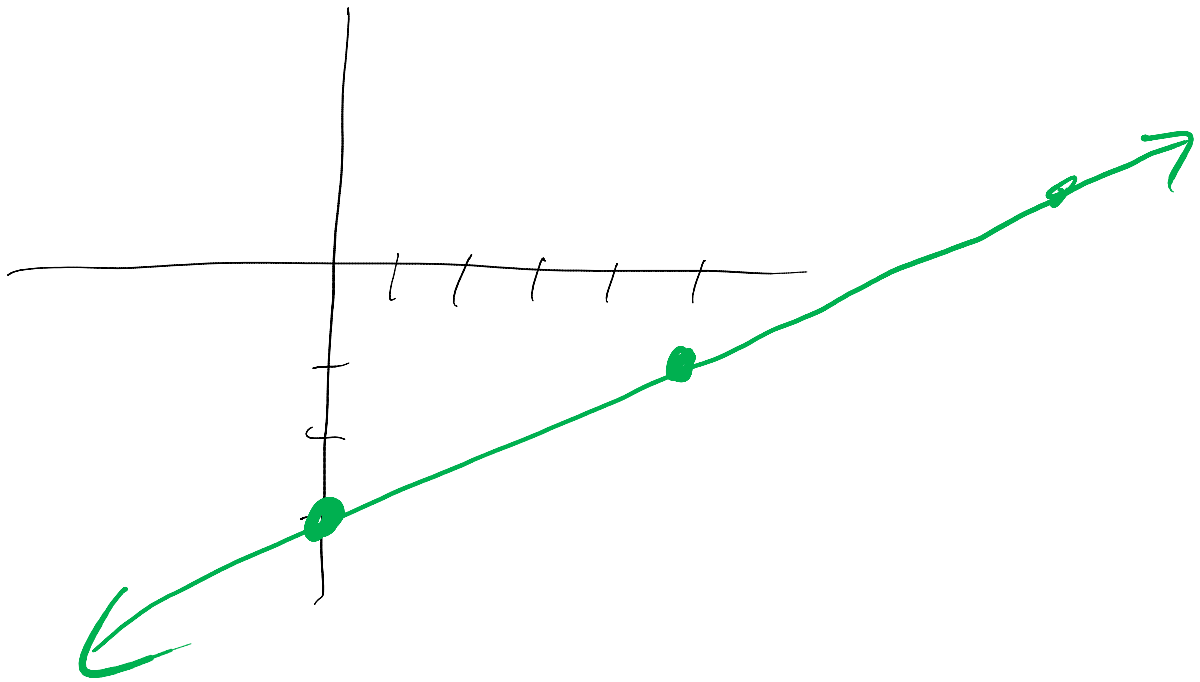
- $y = c$



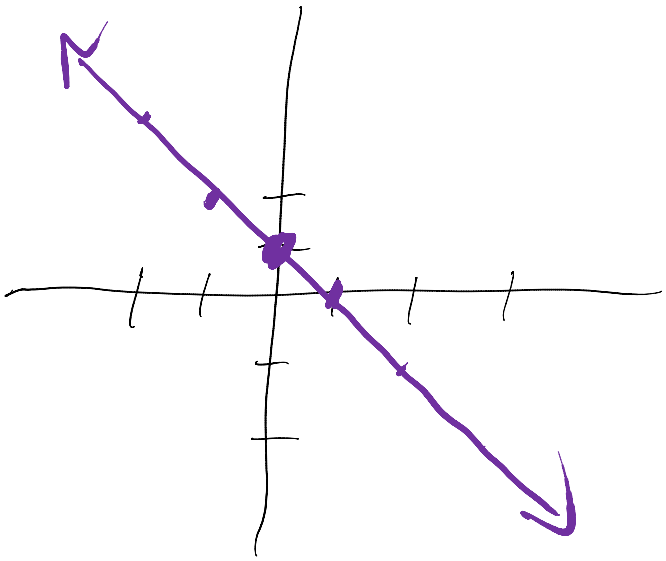
Graphing from Slope-Intercept

1. Graph y-int $(0, b)$
2. Use slope to find next point.
3. Connect dots

Ex: $y = \frac{2}{5}x - 3$



Ex: $y = -x + 1$



Ex: $2x - 3y = 6$

$-2x \qquad -2x$

$$\frac{-3y}{-3} = \frac{-2x}{-3} + \frac{6}{-3}$$

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

$m = \frac{2}{3}$ $\qquad$ y-int: -2

Ex: $3x + 5y = 20$

A B C

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

Slope from Standard Form:

$$m = -\frac{A}{B}$$

$$y\text{-int} = \frac{C}{B}$$

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② Point-Slope Form

$$y - y_1 = m(x - x_1)$$

where m is the slope

(x_1, y_1) is a point

Ex: slope: $\underset{m}{\frac{1}{3}}$ point: $(\underset{x_1}{2}, \underset{y_1}{6})$

P-S: $y - 6 = \frac{1}{3}(x - 2)$

Graph using P-S.

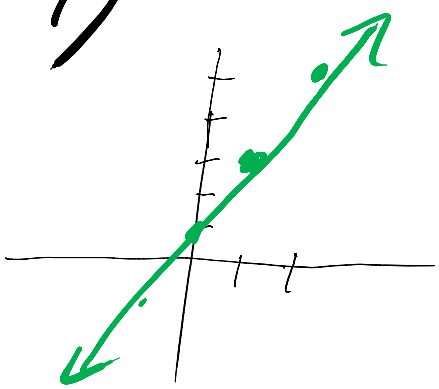
① Graph the point

② Use slope to find next

Ex: $y - 3 = 2(x - 1)$

point: $(1, 3)$

slope: 2



Ex: $y - 5 = -\frac{1}{2}(x + 3)$

point: $(-3, 5)$

slope: $-\frac{1}{2}$

Convert P-S to S-I

$y + 10 = -\frac{1}{4}(x - 8)$

① Distribute

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

$-10 \qquad -10$

$y = -\frac{1}{4}x - 8$

Write an equation of a line with $m = 2$ and goes through $(1, -5)$ (x_1, y_1)

$y - y_1 = m(x - x_1)$

$y + 5 = 2(x - 1)$

$y + 5 = 2x - 2$

$\boxed{y = 2x - 7}$

$y = mx + b$

$-5 = 2(1) + b$

$-5 = 2 + b$

$b = -7$

$\boxed{y = 2x - 7}$

Write eq of vertical line thru $(-3, 8)$

x y

$\boxed{x = -3}$

Parallel and Perpendicular

Parallel Lines -

Two lines are parallel
if and only if (iff, $\Leftrightarrow$)
they have the same slope
and different intercepts

Perpendicular Lines

... iff their slopes are

opposite - reciprocal

$(+, -)$ $\left(\frac{a}{b}, \frac{b}{a}\right)$

$$m_1 \cdot m_2 = -1$$

$$\frac{3}{2} \cdot -\frac{2}{3} = -1$$