

2.2 Find Slope and Rate of Change

Formulas:

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}} = m$$

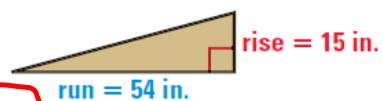
$$\frac{\text{slope-int}}{y = mx + b}$$

$$\frac{\text{point-slope}}{y - y_1 = m(x - x_1)}$$

$$\frac{\text{Standard form}}{Ax + By = C}$$

EXAMPLE 1 Find slope in real life

SKATEBOARDING A skateboard ramp has a rise of 15 inches and a run of 54 inches. What is its slope?



$$m = \frac{\text{rise}}{\text{run}} = \frac{15 \cancel{\text{in}}}{54 \cancel{\text{in}}} = \boxed{\frac{5}{18}}$$

EXAMPLE 2 Standardized Test PracticeWhat is the slope of the line passing through the points $(-1, 3)$ and $(2, -1)$?

(A) $-\frac{4}{3}$

(B) $-\frac{3}{4}$

(C) $\frac{3}{4}$

(D) $\frac{4}{3}$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 3}{2 - (-1)} = \frac{-4}{3}$$

↙

$$\frac{3 - (-1)}{-1 - 2} = \frac{4}{-3}$$

Find the slope of the line passing through the given points.

(0, 3), (4, 8)

$$\frac{y_2 - y_1}{x_2 - x_1}$$
$$\frac{8 - 3}{4 - 0} = \boxed{\frac{5}{4}}$$

(7, 3), (-1, 7)

$$\frac{7 - 3}{-1 - 7} = \frac{4}{-8}$$
$$= \boxed{-\frac{1}{2}}$$

EXAMPLE 3 Classify lines using slope

Without graphing, tell whether the line through the given points *rises*, *falls*, *is horizontal*, or *is vertical*.

a. $(-5, 1), (3, 1)$

$$\frac{1-1}{3+5} = \frac{0}{8} = 0$$

Horizontal

c. $(-1, 3), (5, 8)$

$$\frac{8-3}{5+1} = \frac{5}{6}$$

rises

b. $(-6, 0), (2, -4)$

$$\frac{-4-0}{2+6} = \frac{-4}{8} = -\frac{1}{2}$$

falls

d. $(4, 6), (4, -1)$

$$\frac{-1-6}{4-4} = \frac{-7}{0} = \text{undef.}$$

vert

EXAMPLE 4 Classify parallel and perpendicular linesTell whether the lines are *parallel*, *perpendicular*, or *neither*.

- ~~a~~ Line 1: through $(-2, 2)$ and $(0, -1)$
 Line 2: through $(-4, -1)$ and $(2, 3)$

$$\frac{-1-2}{0+2} = \frac{-3}{2} \quad \text{perp}$$

$$\frac{3+1}{2+4} = \frac{4}{6} = \frac{2}{3}$$

- ~~b~~ Line 1: through $(1, 2)$ and $(4, -3)$
 Line 2: through $(-4, 3)$ and $(-1, -2)$

$$\frac{-3-2}{4-1} = \frac{-5}{3}$$

$$\frac{-2-3}{-1+4} = \frac{-5}{3} \quad \text{para}$$

- Line 1: through $(-4, -2)$ and $(1, 7)$
 Line 2: through $(-1, -4)$ and $(3, 5)$

$$\frac{7+2}{1+4} = \frac{9}{5} \quad \frac{5+4}{3+1} = \frac{9}{4}$$

neither

Stop here and work on Section 2.2

2.3 Graph Equations of Lines

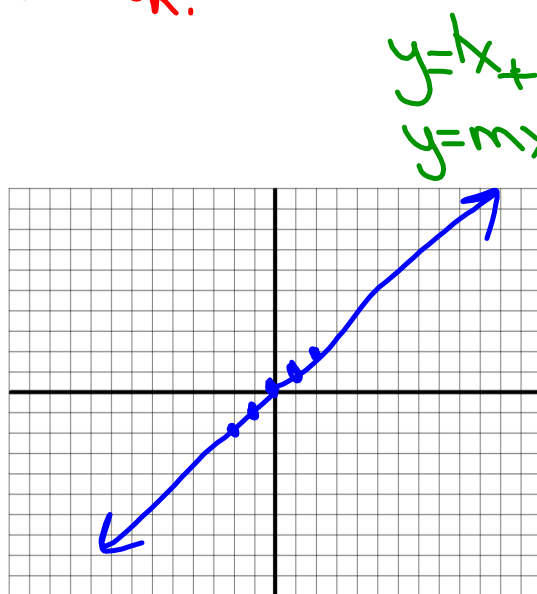
Vocab:

Parent Function - the most basic type of a function.

$y = x$

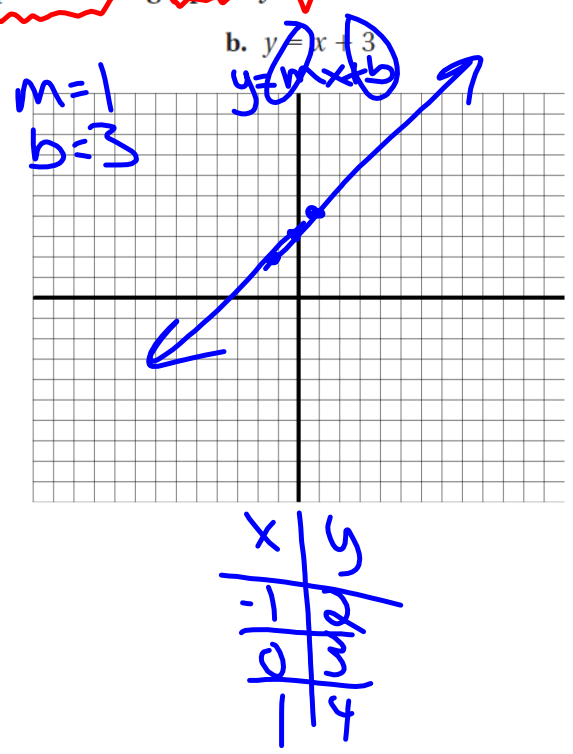
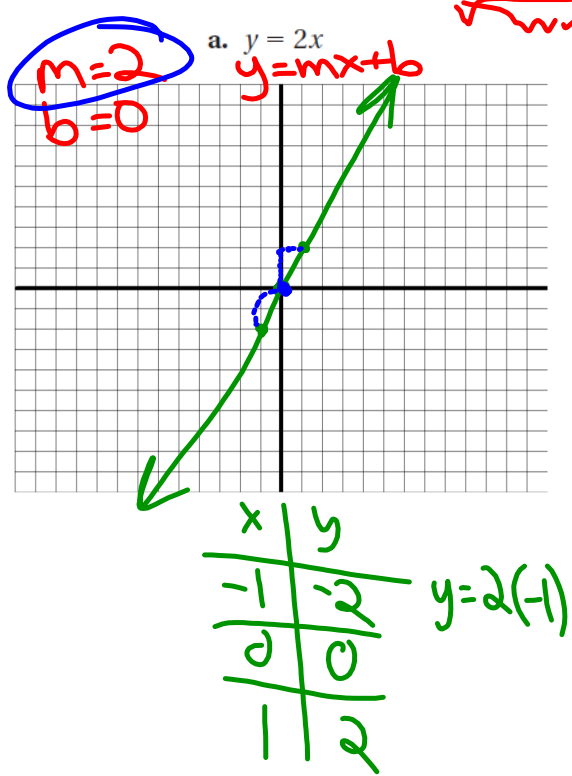
x	y
-2	-2
-1	-1
0	0
1	1
2	2

$y = -2$



EXAMPLE 1 Graph linear functions

Graph the equation. Compare the graph with the graph of $y = x$.

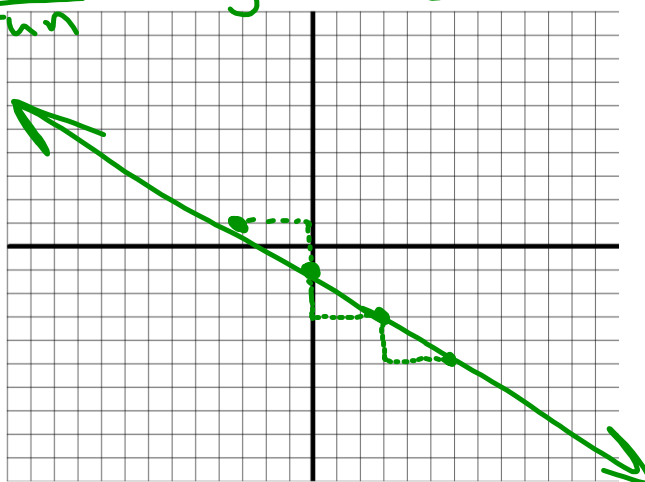


EXAMPLE 2**Graph an equation in slope-intercept form**Graph $y = -\frac{2}{3}x - 1$.

$$y = mx + b$$

$$m = -\frac{2}{3} = \frac{\text{rise}}{\text{run}}$$
$$b = -1$$

↓
y-intercept



Graph the equation.

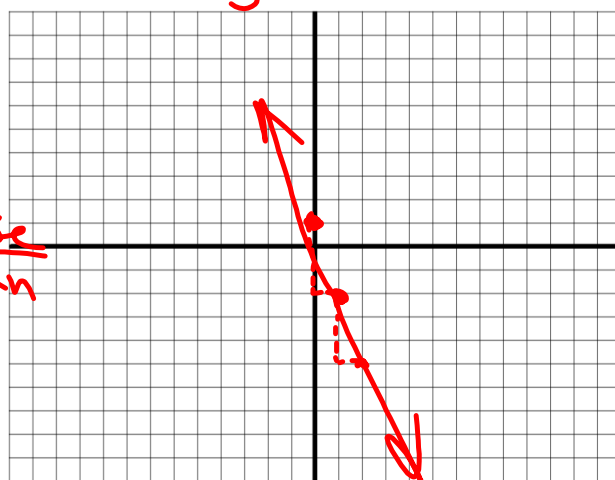
$$f(x) = 1 - 3x$$
$$y = 1 - 3x$$

$$y = mx + b$$

$$y = -3x + 1$$

$$m = \frac{-3}{1} = \frac{\text{rise}}{\text{run}}$$

$$b = 1$$



EXAMPLE 3 Solve a multi-step problem

BIOLOGY The body length y (in inches) of a walrus calf can be modeled by $y = 5x + 42$ where x is the calf's age (in months).

Graph the equation.

- Describe what the slope and y -intercept represent in this situation.
- Use the graph to estimate the body length of a calf that is 10 months old.



$$y = 5x + 42$$

m

Started at 42 in

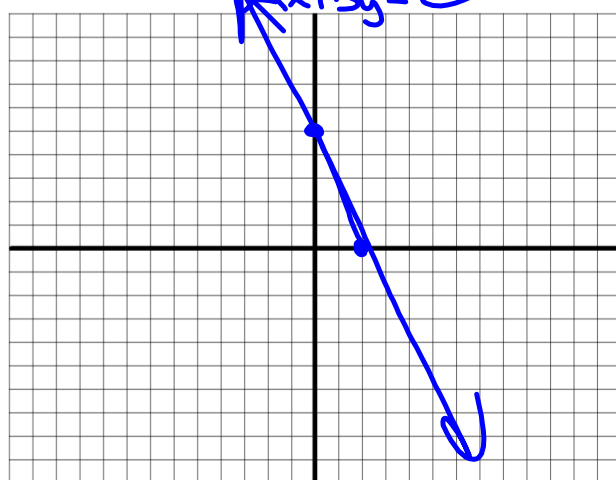
grows at 5 in per month

EXAMPLE 4 Graph an equation in standard formGraph $5x + 2y = 10$.

$$\begin{aligned} & \text{x-int} \\ & y=0 \end{aligned}$$

$$\begin{aligned} 5x + 2(\cancel{y}) &= 10 \\ 5x &= 10 \end{aligned}$$

$$\begin{aligned} x &= 2 \\ \boxed{(2, 0)} \end{aligned}$$



$$\begin{aligned} & \text{y-int} \\ & x=0 \end{aligned}$$
$$\begin{aligned} \cancel{5}x + 2y &= 10 \\ 2y &= 10 \\ y &= 5 \end{aligned}$$
$$\boxed{(0, 5)}$$

EXAMPLE 5 Graph horizontal and vertical linesGraph (a) $y = 2$ and (b) $x = -3$.