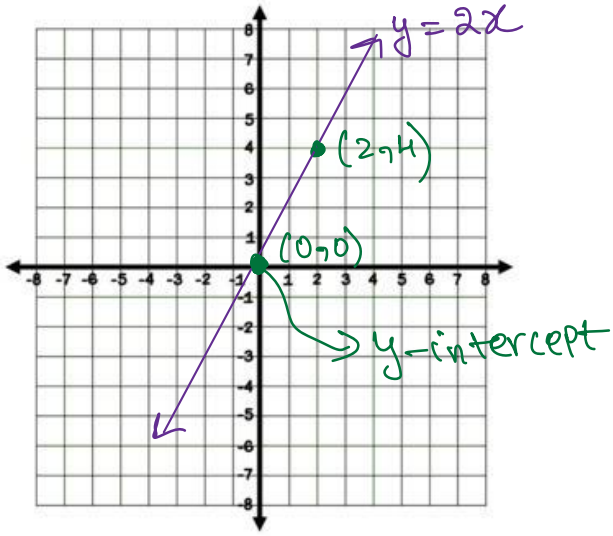
2.3 Slope Intercept Form

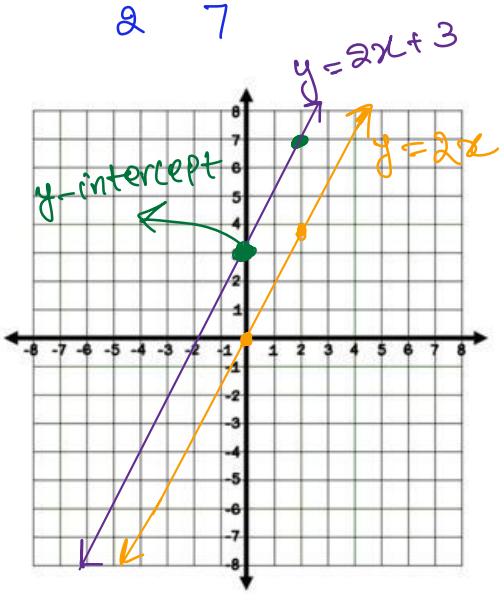
Example : Graph $y = 2x$

x	y
0	0
2	4

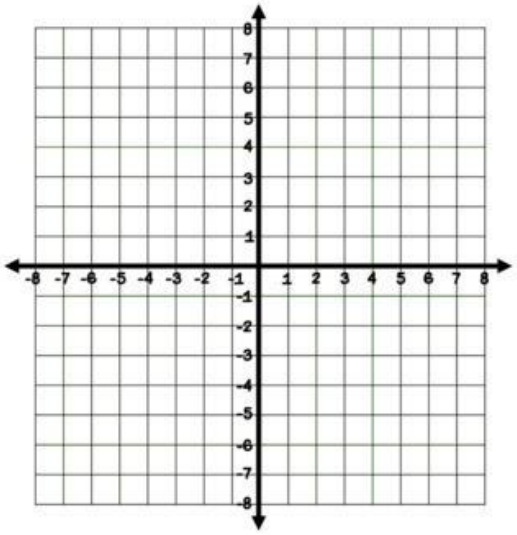


Example : Graph $y = 2x + 3$

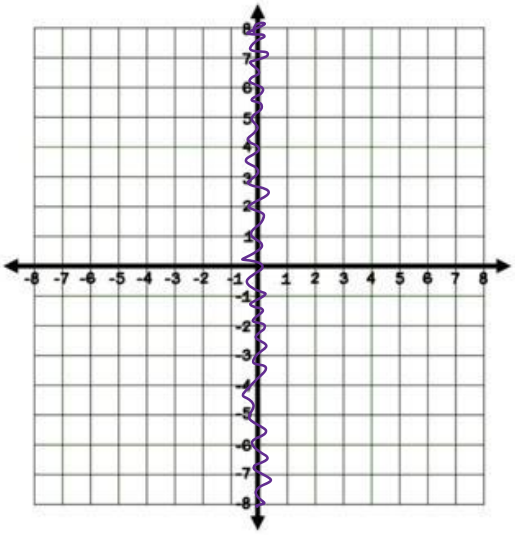
x	y
0	3
2	7



Example : Graph $y = -\frac{1}{3}x$



Example : Graph $y = -\frac{1}{3}x - 3$



Example : Find the y- intercept → a Point where x-coordinate is 0 (on a given line)

The Point where a given line meets the y-axis.

a) $y = -5x + 7$

Put $x = 0$ and find corresponding y value

$y = -5x + 7$ (x = 0)

$y = -5(0) + 7 = 7$

$\Rightarrow$ y-int. $= (0, 7)$

b) $f(x) = 5.3x - 12$

Put $x = 0$

$f(0) = 5.3(0) - 12$

$= -12$

$\Rightarrow$ y-int. $= (0, -12)$

Slope

The **slope of a line** passing through two points (x_1, y_1) and (x_2, y_2) is calculated as:

$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{vertical change}}{\text{horizontal change}}$$

This means slope is the **difference in the y-values** divided by the **difference in the x-values**:

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

Example: Find the slope of the line given $(6,2) and\ (3,5)$

x_1 y_1 x_2 y_2

$$m = \frac{5 - 2}{3 - 6} = \frac{3}{-3} = -1$$

Example: Find the slope of the line given $(5,5) and\ (2,-10)$

$$m = \frac{-10 - 5}{2 - 5} = \frac{-15}{-3} = 5$$

Slope Intercept Form : $y = mx + b$ (m: slope, b: y-intercept)

Example : Determine the slope and the y-intercept of the line given by

a) $y = \frac{2}{3}x + 4$

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

y-intercept $= (0, 4)$ or 4

b) $2x - y = 3$

$\Rightarrow -y = -2x + 3$ (subtract $2x$, then $\div -1$)

$\Rightarrow y = \frac{1}{-1}(-2x + 3) = 2x - 3$

slope $= 2$ $\Rightarrow$ y-intercept $= (0, -3)$ or -3

c) $y = x - 2$

d) $4x + 5y = 8$

$\Rightarrow 5y = -4x + 8 \Rightarrow y = -\frac{4}{5}x + \frac{8}{5}$

slope $= -\frac{4}{5}$, y-int. $= \frac{8}{5}$ or $(0, \frac{8}{5})$

Example : Find the equation of a line whose

a) slope is 3 and y-intercept is (0,-1)

$y = 3x + (-1)$

$\Rightarrow y = 3x - 1$

b) slope is -4 and y-intercept is (0,1)

$y = -4x + 1$

c) slope is $-\frac{2}{3}$ and y-intercept is (0,-2)

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

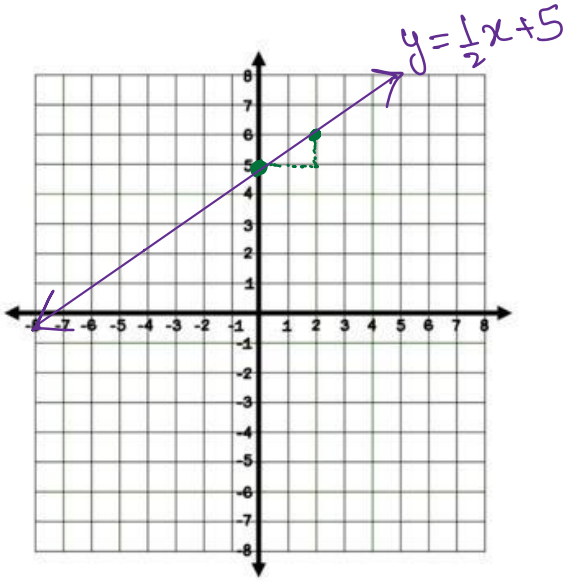
d) slope is $\frac{3}{4}$ and y-intercept is (0,-5)

Example : Determine the slope and y- intercept of the line given by the function. Then draw the graph.

a) $f(x) = \frac{1}{2}x + 5$

slope $= \frac{1}{2}$, y-int $= (0, 5)$

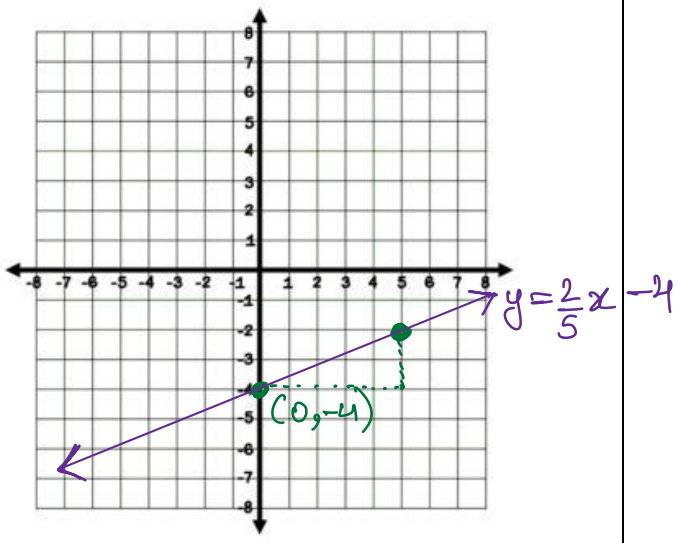
$= \frac{\text{rise}}{\text{run}}$



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

slope $= \frac{2}{5}$, y-int $= -4$

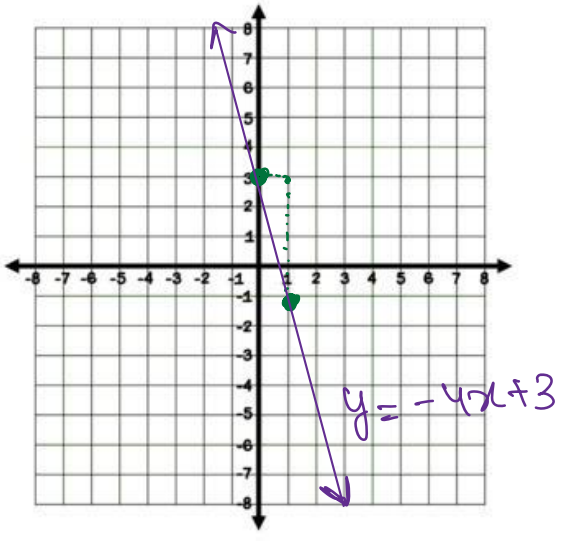
$= \frac{\text{rise}}{\text{run}}$



c) $4x + y = 3$

$y = -4x + 3$

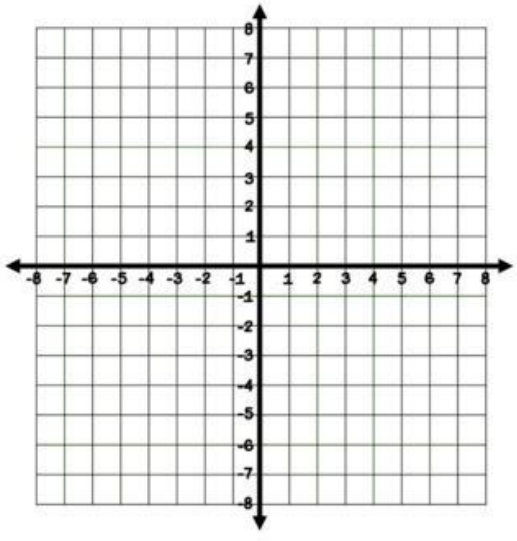
slope $= -4$, y-int $= (0, 3)$



d) $4y + 20 = x$

$4y = x - 20 \Rightarrow y = \frac{1}{4}x - 5$

slope $= \frac{1}{4}$, y-int $= -5$



Applications

Example: A computer recycling business uses the function given by $V(t) = -400t + 1200$ to determine the salvage value V(t), in dollars, of a particular computer t years after its purchase

$t=0$

$V(0) = 1200$

a) what do the numbers -400 and 1200 signify?

$1200 = V(0) \rightarrow$ Price when $t=0$

Price at the Purchase date

slope $= -400$

→ The value of computer is decreasing by $\$400$ every year

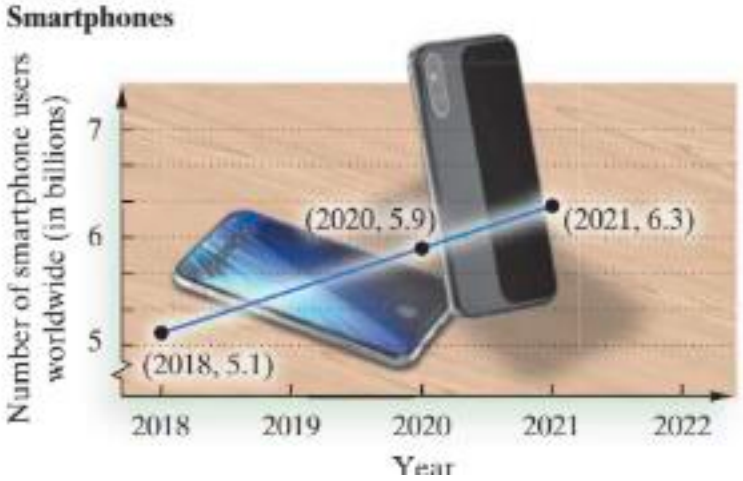
b) How long will it take the machine to completely depreciate?

t at which $V(t) = 0$

$-400t + 1200 = 0 \Rightarrow -400t = -1200$

$\Rightarrow t = \frac{-1200}{-400} = 3 \Rightarrow t = 3$ years.

Example: The number of worldwide smartphone sub-scribers has been changing, as shown in the following graph. Use the graph to find the rate at which this number is changing. Note that the jagged "break" on the vertical axis is used to avoid including a large portion of unused grid



$m_1 = \frac{5.9-5.1}{2020-2018} = \frac{0.8}{2} = 0.4$, $m_2 = \frac{6.3-5.9}{2021-2020} = 0.4$

rate = 0.4 billion subscribers every year.