HW online now!

Section 1.3 – Linear Functions

Linear Functions

Changes at a constant rate (slope)

Slope Intercept Form ← (0,b) y-int

$y = mx + b$

↖ m = slope

Slope of a line thru points (x_1, y_1) & (x_2, y_2)

$$m = \frac{\text{RISE}}{\text{RUN}}$$

$$= \frac{\text{change in } x}{\text{change in } y}$$

delta →

$$= \frac{\Delta y}{\Delta x}$$

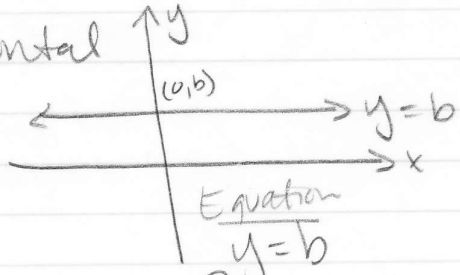
$$= \frac{y_2 - y_1}{x_2 - x_1} \quad \text{OR} \quad = \frac{y_1 - y_2}{x_1 - x_2}$$

$m > 0$ (pos) uphill / increasing

$m < 0$ (neg) downhill / decreasing

Horizontal / Vertical lines

Horizontal

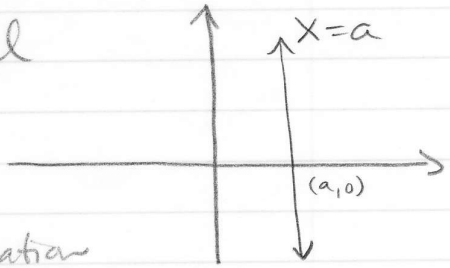


Equation

$y = b$

Slope = 0

Vertical



Equation

$x = a$

Slope is undefined $\frac{\text{RISE}}{0}$ = UN

Point slope form of the equation of the line

$y - y_1 = m(x - x_1)$ where m is slope

(x_1, y_1) is ANY point

ex. Find the equation of the line thru $(\underset{x_1}{5}, \underset{y_1}{-2})$ with slope of $\underset{m}{\frac{1}{2}}$.

$$y - (-2) = \frac{1}{2}(x - 5)$$

$$y + 2 = \frac{1}{2}x - \frac{5}{2}$$

$$y = \frac{1}{2}x - \frac{5}{2} - \frac{2}{1}\left(\frac{2}{2}\right)$$

$$y = \frac{1}{2}x - \frac{5}{2} - \frac{4}{2}$$

$$\boxed{y = \frac{1}{2}x - \frac{9}{4}}$$

ex. Find the equation of the line thru $(\underset{x_1}{5}, \underset{y_1}{-1})$ & $(\underset{x_2}{-2}, \underset{y_2}{3})$

$$m = \frac{3 - (-1)}{-2 - 5} = \frac{3+1}{-7} = \frac{-4}{7}$$

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

$$y + 1 = -\frac{4}{7}(x - 5)$$

$$y = -\frac{4}{7}x + \frac{20}{7} - 1\left(\frac{7}{7}\right)$$

$$y = -\frac{4}{7}x + \frac{20}{7} - \frac{7}{7}$$

$$\boxed{y = -\frac{4}{7}x + \frac{13}{7}}$$

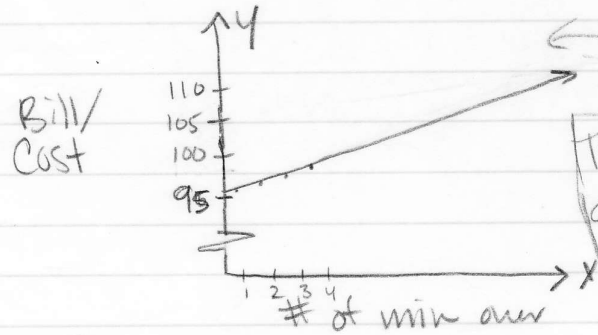
Slope-Intercept Form
$y = mx + b$
Point-Slope Form
$y - y_1 = m(x - x_1)$
Standard Form
$Ax + By = C$ where A, B, & C are integers.
ex. $5x - 3y = 6$

Application

At verizon I pay $96 per month and if I go over my minute, I am charged 60 cents a minute for every minute I go over. Find a linear equation to model this scenario.

Declare variables:
Let y be my monthly bill and
x be the number of minutes I go over my limit

$y = .60x + 96$

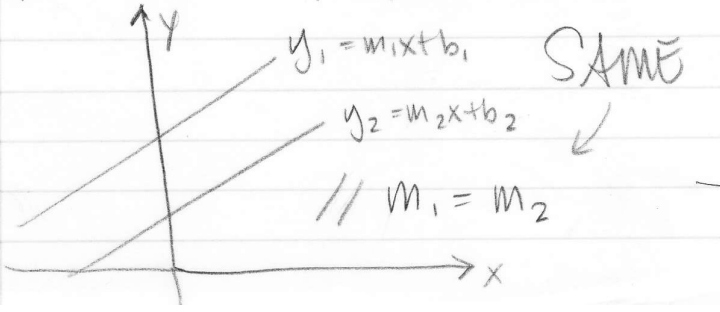


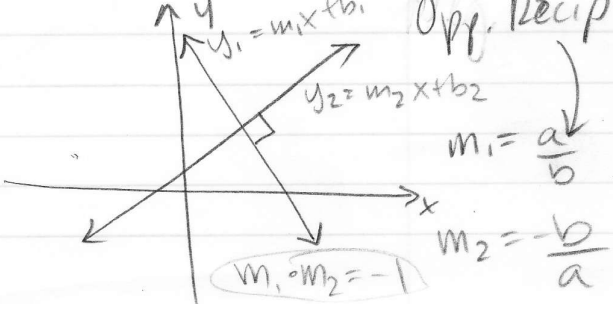
$109.80 - 96 = .6x$
$13.8 = .6x$
$23 = x$

Think about scale
don't draw graphs too small

If I had a bill of $109.80 how many minutes did I go over?

Parallel & Perpendicular Lines





Write the equation of the line parallel to $x+3y=5$ thru $(-2,3)$.

Given: a point

Need Slope: $m=?$

$x+3y=5$

$3y=-x+5$ Same slope

$y=-\frac{1}{3}x+\frac{5}{3}$ $m_1=-\frac{1}{3}$

$m_1=-\frac{1}{3}$ $(-2,3)$ x_1, y_1

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

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

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

$y=-\frac{1}{3}x-\frac{2}{3}+\frac{9}{3}$

$\boxed{y=-\frac{1}{3}x+\frac{7}{3}}$

Equation of a line perpendicular to same line $x+3y=5$ thru $(5,-1)$ x_1, y_1

$m_1=-\frac{1}{3}$ $\perp$ $m_2=3$

$y+1=3(x-5)$

$y=3x-15-1$

$\boxed{y=3x-16}$ You can check on graphing calc.