

Linear Equations Notes

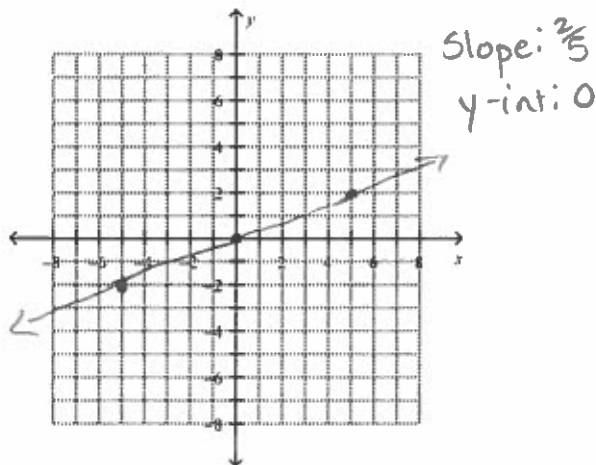
There are three general linear equations that we will use.

1. Standard Form: $Ax + By = C$ *this one is helpful with finding the intercepts
2. Slope-Intercept Form: $y = mx + b$ *this one is helpful when you have a slope and y-intercept
3. Point-Slope Form: $y - y_1 = m(x - x_1)$ *this one is used best when you have at least one point

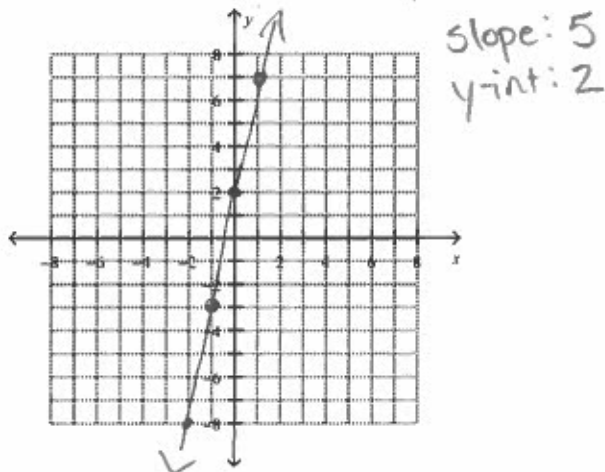
Slope/Rate of Change Formula : $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$

Example 1... Solve each equation for y. Then find the slope and y-intercept and graph the line.

a. $2x - 5y = 0$
 $\begin{matrix} -5y = -2x \\ \frac{-5y}{-5} = \frac{-2x}{-5} \\ y = \frac{2}{5}x \end{matrix}$



b. $5x - y = -2$
 $\begin{matrix} -y = -5x - 2 \\ \frac{-y}{-1} = \frac{-5x - 2}{-1} \\ y = 5x + 2 \end{matrix}$



Example 2... Find the slope through the points.

a. $(0, 1)$ and $(3, 0)$
 $\begin{matrix} (x_1, y_1) & (x_2, y_2) \end{matrix}$

$$\frac{0 - 1}{3 - 0} = \frac{-1}{3}$$

b. $(4, -1)$ and $(-2, -3)$
 $\begin{matrix} (x_1, y_1) & (x_2, y_2) \end{matrix}$

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

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

Example 3... Write the equation in point-slope form of the line that goes through the points:

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

a. $(-3, -2)$ and $(1, 6)$
 x_1, y_1 x_2, y_2

b. $(1, 0)$ and $(5, 5)$
 x_1, y_1 x_2, y_2

$$m = \frac{6 - (-2)}{1 - (-3)} = \frac{6 + 2}{1 + 3} = \frac{8}{4} = 2$$

$$m = \frac{5 - 0}{5 - 1} = \frac{5}{4}$$

$$y - 6 = 2(x - (-3))$$

$$y - 0 = \frac{5}{4}(x - 1)$$

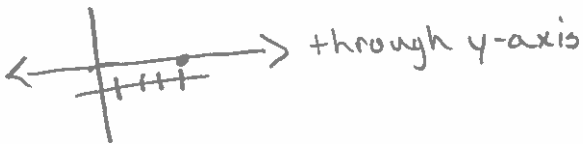
$$y - 6 = 2(x + 3)$$

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

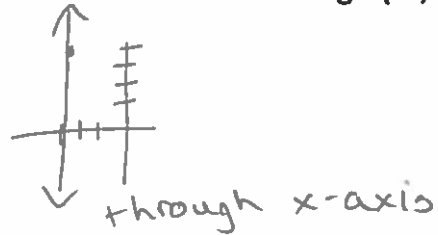
Example 4... Write the equations of the lines:

a. a horizontal line through $(4, 1)$

b. a vertical line through $(-3, 4)$



$$y = 1$$



$$x = -3$$

Example 5... Write the equations of the lines:

a. through $(-1, 3)$ and parallel to $y = 2x + 1$
 x_1, y_1 \hookrightarrow same slope
 $m = 2$

b. through $(2, 2)$ and perpendicular to $y = -\frac{3}{5}x + 2$
 x_1, y_1 \hookrightarrow opposite reciprocal
 $m = -\frac{3}{5} \rightarrow \frac{5}{3}$

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

$$y - 3 = 2(x + 1)$$

$$y - 2 = \frac{5}{3}(x - 2)$$

Example 6... Write the following equations in standard form: $Ax + By = C$

a. $y = -2x + 7$
 $+2x$ $+2x$

$$2x + y = 7$$

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

\swarrow must be positive and whole

$$3\left(\frac{1}{3}x + y = -5\right)$$

$$x + 3y = -15$$