How to Graph Linear Equations

Definition 1.1: An equation is **linear** if it looks like

$$y = mx + b.$$

Where m, b are real numbers and x, y are variables.

Example 1.1: Here are some examples of linear equations,

1. $y = 2x + 4$
2. $y = 3$
3. $y = \frac{-2}{3}x + 7$

Example 1.2: The following are examples of non-linear graphs.

1. $y = x^2 + 2x + 4$
2. $y^2 + x^2 = 4$ (What is this?)

We are often interested about how linear equations look like geometrically on a Cartesian Plot, we call these plots the graph of the linear equation.

Example 1.3: Here are what the graphs of the linear equations from Example 2.1 look like. **(In class)**

Definition 1.2: The **slope** of a linear equation is a measure of how 'steep' its graph is. The slope is given by the number m in $y = mx + b$.

We say that larger values of m correspond to graphs that have very steep slopes. **(Class explanation)**

Example 1.4: What were the slopes of the linear equations from Example 2.1? **(In class)**

Definition 1.3: The **y-intercept** of a liner equation is the point where the graph intersects the y-axis. This point is given by the number b in $y = mx + b$.

Example 1.5: What were the y-intercept's of the linear equations from Example 2.1? **(In class)**

At this point we would like to answer the following question, if I give you a liner equation $y = mx + b$, can you plot its graph? We can! by using the following procedure,

Procedure 1.1: Graphing Linear equations.

1. Identify the slope and the y-intercept.
2. Label the y-intercept on the y-axis.
3. Remeber that,
$$\text{slope} = \frac{\text{rise}}{\text{run}}.$$
Starting from the y-intercept go up by 'rise' units and go to the right by 'run' units. (Remeber that a negative 'rise' means go down and a negative 'run' means go left).
4. Label the point where you end up at.
5. Draw a straight line through the two points you have labelled.
6. Finish by labelling the graph and drawing the tip arrows.

Example 1.6: Graph the following linear equations. **(In class)**

1. $y = -2x + 6$
2. $y = \frac{-2}{3}x - 1$
3. $y = \frac{1}{-2}x$

Definition 1.4: The **x-intercept** of a liner equation is the point where the graph intersects the x-axis. This point is given by the solution to $0 = mx + b$. (Solving for x)

Example 1.7: Determine the x-intercepts of the following linear equations.**(In class)**

1. $y = 2x - 3$
2. $y = \frac{-2}{5}x + 2$
3. $y = 5x$
4. $y = 3$