**Section 1.4** (Linear Functions and Slope)

The steepness of a line (or linear function) can be described by the ***slope*** of the line

We measure the slope of a line as a ratio of vertical change to horizontal change. Consider a sample graph.

Run

x2 – x1

y2

Rise

y2 – y1

y1

x2

x1

The slope of a graph (line) is defined by slope = m ===where x2 ≠ x1

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Example: Find the slope of the line containing (-2,4) and (1,-2). Do the same with the line containing (3,2) and (6,4), then points (-1,3) and (1,3). Graph the lines.

The slope of a graph and how it slants are related as follows (sketch)

* Slants up left to right => Positive slope (positive change in y, positive change in x)
* Slants downward from left to right => Negative slope (negative change in y, positive change in x)
* Horizontal => 0 slope (change in y is 0)
* Vertical => Undefined slope (change in x is 0)

A non-vertical line with slope m that passes through point (x1 , y1) can be described by the ***point-slope*** equation **y – y1 = m(x – x1)**

Example: Write an equation in point-slope form for the line…

With slope 2 and passing through (-1,-2) Passing through the points (-1,2) and (4,-3)

Another useful form to describe a line is the ***slope-intercept*** form **y = mx + b**, where the slope is m and the y-intercept of the line is (0,b).

Example: Write an equation in slope-intercept form of the line…

With y-intercept of (0,2) and slope of -3 Passing through the points (-1,2) and (4,-3)

Example: Write the equation of the line that has an x-intercept of 2 and y-intercept of 6.

It is often easier and much less time consuming to graph linear functions that are in slope-intercept form

Example: Graph **f(x) = x – 1** and **g(x) = – 2x + 3**

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While not all lines can be described in slope-intercept form (think about the slope of vertical lines), every line has an equation in ***general*** form (standard form) **Ax + By + C = 0** where A and B are not both 0.

We can still find the slope and y-intercept by solving general linear equations for y (isolating y).

Example: Find the slope and y-intercept for

y = -2x y = ½x – 3 y = -8 4x + 2y = -8 3x – 9y = 18

Example: Describe the graphs of y = -2 and x = 3.

**Note: For a line with positive slope m, as m increases, the line becomes steeper.**