Everything you always wanted to know about

Straight Lines

Straight-line equations are those that are first degree in both *x* and *y*.

Slope: the measure of "steepness" of a line. Two points on the line are needed to determine the slope.

***Slope* = *m* =** $\frac{change\ in\ y}{change\ in\ x} = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$ *where* (x_1, y_1) *and* (x_2, y_2) *are the coordinates of any two points on the line*

Line Equations:

- **Point-Slope Form:** $y - y_1 = m(x - x_1)$
  where (x_1, y_1) *is the point and* ***m*** *is the slope*
  Need a point and the slope to use this form

- **Slope-Intercept Form:** $y = mx + b$
  where ***m*** *is the slope and* ***b*** *is the y-intercept (0,b)*
  Need a slope and a point on the line, OR Need the slope and *y*-intercept

*****Equations must be in the slope-intercept form (solved for *y*) in order to easily "see" what the slope and *y*-intercept are.

Parallel Lines…have the same slopes and different y-intercepts

Perpendicular Lines…have slopes that are negative reciprocals. If the slope of one line is *4*, then the slope of the perpendicular line is $-\frac{1}{4}$.

Graphing Linear Equations:

- Find the *x*-intercept by letting $y = 0$, then find the *y*-intercept by letting $x = 0$. Plot these two points, and draw the line that connects the two points.
- If the equation is given in *slope-intercept* (*y=mx+b)* form: Plot the *y*-intercept first. From the *y*-intercept, use the slope information to go up/down, then right, to obtain another point. Connect these two points, and you have graphed the line.

Vertical Lines…are missing the *y* variable. The slope of a vertical line is undefined.
$x = 3$ is the equation of a vertical line, where the *x* coordinate is always 3, and the *y* coordinate can be any value.

Horizontal Lines…are missing the *x* variable. The slope of a horizontal line is zero.
$y = 2$ is the equation of a horizontal line, where the *y* coordinate is always 2, and the *x* coordinate can be any value.

Horizontal and Vertical lines are perpendicular.