Algebra II Notes #1 Unit 2 page 1

- Standard Form of a Linear Equation: An equation is a linear equation in x and y if it can be written in the form Ax + By = C where A, B, and C are numbers and A and B are not both zero. This equation (Ax + By = C) is said to be in standard form. The graph of every linear equation is a straight line.

- Definition: The Slope of a Straight Line - If $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$ represent two points on a line, then the slope, m, is defined by the following equation:

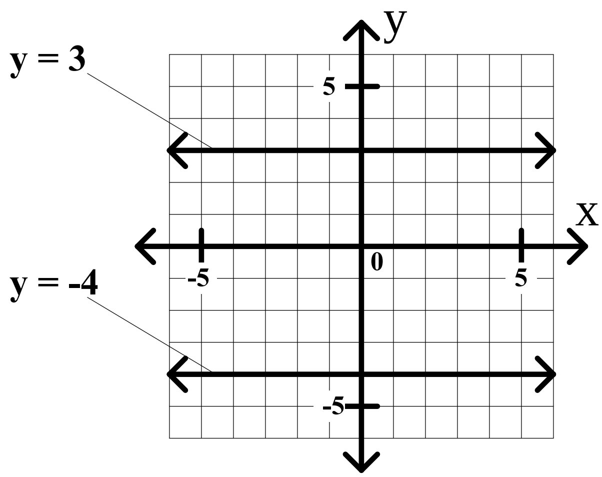
$$\mathbf{m = \frac{y_2 - y_1}{x_2 - x_1}}$$

- Definition: The y-Intercept of a Straight Line - The y-intercept of a straight line (or of the linear equation it represents) is the value of y when x is 0. If a straight line intersects the y-axis at the point (0,b), then the number b is called the y-intercept. To find the y-intercept of a linear equation given in standard form, let x = 0 and solve for y.
- Definition: The x-Intercept of a Straight Line - The x-intercept of a straight line (or of the linear equation it represents) is the value of x when y is 0. If a straight line intersects the x-axis at the point (c,0), then the number c is called the x-intercept. To find the x-intercept of a linear equation given in standard form, let y = 0 and solve for x.

There are 3 types of straight lines we will discuss. They are horizontal, vertical, and oblique.

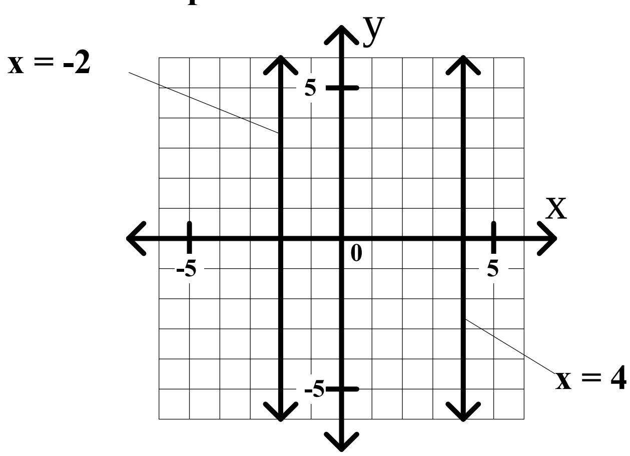
- Type 1: Horizontal lines. The x-axis, or any line parallel to it, is considered to be a horizontal line. Consider example 1 below. Notice that all points on any horizontal line have the same y-coordinate. Because of this, horizontal lines are commonly described by an equation of the form y = k for some specific real number k. The equation of the x-axis is y = 0, since the y-coordinate of every point on the x-axis is 0. In the standard form equation, Ax + By = C , if A = 0, then the equation represents a horizontal line. If $P_1(x_1,y_1)$ and $P_2(x_2,y_2)$ represent any two points on a horizontal line, then $y_1 = y_2$. Therefore, the slope of every horizontal line is zero. Note that horizontal lines do not have an x-intercept.

Example 1: Horizontal Lines



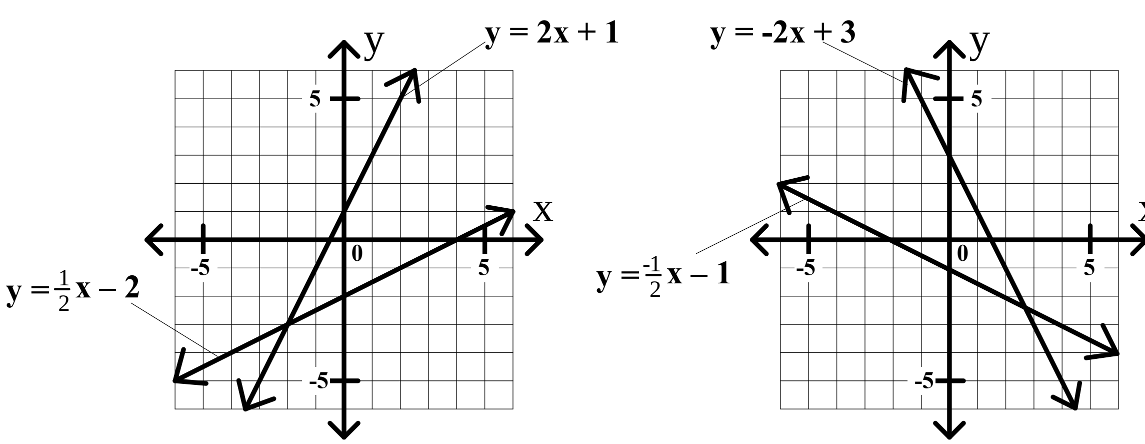
- Type 2: Vertical lines. The y-axis, or any line parallel to it, is considered to be a vertical line. Consider example 2 below. Notice that all points on any vertical line have the same x-coordinate. Because of this, vertical lines are commonly described by an equation of the form $x = k$ for some specific real number k. The equation of the y-axis is $x = 0$, since the x-coordinate of every point on the y-axis is 0. In the standard form equation, $Ax + By = C$, if $B = 0$, then the equation represents a vertical line. If $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$ represent any two points on a vertical line, then $x_1 = x_2$. Therefore, the slope of every vertical line is undefined. Note that vertical lines do not have a y-intercept.

Example 2: Vertical Lines



- Type 3: Oblique lines. Any line that is neither horizontal nor vertical is called an oblique line. In the standard form equation, $Ax + By = C$, if neither A nor B is 0, then the equation represents an oblique line. The most common equation used to describe an oblique line is called the slope-intercept equation. The slope-intercept equation of an oblique line is $y = mx + b$, where m is the slope of the line and b is the y-intercept of the line. To find the slope intercept equation, just solve for y. Notice that oblique lines with positive slopes slant up to the right, and oblique lines with negative slopes slant down to the right. See example 3 below.

Example 3: Oblique Lines



lines with positive slopes

lines with negative slopes