## General Algebra II Class 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 $A x+B y=C$ where $A, B$, and $C$ are numbers and $A$ and $B$ are not both zero. The equation $A x+B y=C$ 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 $P_{1}\left(x_{1}, y_{1}\right)$ and $P_{2}\left(x_{2}, y_{2}\right)$ represent two points on a line, then the slope, $m$, is defined by the following equation:

$$
\mathrm{m}=\frac{\mathrm{y}_{2}-\mathrm{y}_{1}}{\mathrm{x}_{2}-\mathrm{x}_{1}}
$$

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 $\mathbf{y}$-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 ( $\mathbf{c}, \mathbf{0}$ ), then the number $c$ is called the $x$-intercept. To find the $x$-intercept of a linear equation given in standard form, let $\mathbf{y}=0$ and solve for $\mathbf{x}$.
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 $\mathbf{y}=\mathbf{0}$, since the $\mathbf{y}$-coordinate of every point on the $\mathbf{x}$-axis is $\mathbf{0}$. In the standard form equation, $A x+B y=C$, if $A=\mathbf{0}$ then the equation represents a horizontal line. If $P_{1}\left(x_{1}, y_{1}\right)$ and $P_{2}\left(x_{2}, y_{2}\right)$ 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


## General Algebra II Class Notes \#1 Unit 2 page 2

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 $\mathbf{x}=\mathbf{k}$ for some specific real number $k$. The equation of the $\mathbf{y}$-axis is $\mathbf{x}=0$, since the $\mathbf{x}$-coordinate of every point on the $\mathbf{y}$-axis is 0 . In the standard form equation, $A x+B y=C$, if $B=0$ then the equation represents a vertical line. If $P_{1}\left(x_{1}, y_{1}\right)$ and $P_{2}\left(x_{2}, y_{2}\right)$ 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, $A x+B y=C$, 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 $\mathbf{y}=\mathbf{m x}+\mathbf{b}$, where $\mathbf{m}$ 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


