

Name _____

Algebra 2

Lesson 2-6

Families of Functions

On your graphing calculator graph the following functions:

$$y_1 = |x|$$

$$y_2 = |x| + 2$$

$$y_3 = |x| + 4$$

$$y_4 = |x| - 2$$

Describe what you see, differences and similarities.

How are the graphs different?

These 4 equations are a family of functions. The functions are all very similar. This set of equations is called a **family**. The equations of functions in a **family** resemble each other. If the functions resemble each other, then it stands to reason that the graphs in a family look similar as well.

Last section the term **parent function** was mentioned in regard to the absolute value function, $f(x) = |x|$. By definition, a **parent function** is the simplest function that has the common characteristics. By taking the **parent function** and attaching other numbers by adding, subtracting, or multiplying, etc. We get a similar looking function that is **related** to the **parent function**. Since the parent function is transformed into another function this process is called **transformation**.

For the parent function given as	$y = f(x)$	$y = x $
Vertical Translation Up k units, $k > 0$	$y = f(x) + k$	
Vertical Translation Down, k units, $k < 0$	$y = f(x) - k$	
Horizontal Translation Right h units, $h > 0$	$y = f(x - h)$	
Horizontal Translation Left h units, $h < 0$	$y = f(x + h)$	
Combined Translation Right h units and up k units	$y = f(x - h) + k$	
Reflection in x-axis	$y = -f(x)$	
Stretch ($a > 1$) – by a factor of a	$y = af(x)$	
Shrink ($0 < a < 1$) – by a factor of a	$y = af(x)$	
w/ reflection in x-axis	$y = -af(x)$	
Combined Transformation	$y = af(x - h) + k$	