Algebra 2A
2-6 Families of Functions

Name:_____
Date: _____ Hr:_____

Objective:

- To analyze transformations of functions

Common Core Content Standard:

- F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + a, af(x), f(ax), and f(x + a) for the specific values of a (both positive and negative) find the value of a given the graphs.

Shifts, stretches, ~~shrinks~~ compressions, and reflections are called transformations. many graphs of functions can be created from a combination of these.

Vertical and Horizontal Shifts

Let a be a positive real number. Vertical and horizontal shifts in the graph of y = f(x) are represented as follows.

1. Vertical shift a units UP: → $f(x) = x^2 + 2$ UP 2 units
   h(x) = f(x) + a
2. Vertical shift a units DOWN: → $f(x) = x^2 - 2$ DOWN 2 units
   h(x) = f(x) – a
3. Horizontal shift a units to the RIGHT: $f(x) = (x-2)^2$ Right 2 units
   h(x) = f(x – a)
4. Horizontal shift a units to the LEFT: $f(x) = (x+2)^2$ Left 2.
   h(x) = f(x + a)

Reflections

1. Reflection in the x-axis: Make the whole function negative
   h(x) = -f(x)
   Original: $f(x) = 2 - x^2$ Reflected: $-(2 - x^2)$
2. Reflection in the y-axis: Replace x with -x.
   h(x) = f(-x)
   Original: $f(x) = 4x + 1$ Reflected: $4(-x) + 1$

Stretches and Compressions

1. Vertical stretch (if a > 1)
   h(x) = af(x)
   $f(x) = 3x^2$ $3 > 1$ Stretch
2. Vertical ~~shrink~~ compression (if 0 < a < 1)
   h(x) = af(x)
   $f(x) = \frac{1}{3}x^2$ $0 < \frac{1}{3} < 1$ Compression
3. ~~Horizontal shrink (if a > 1)~~
   ~~h(x) = f(ax)~~
4. ~~Horizontal stretch (if 0 < a < 1)~~
   ~~h(x) = f(ax)~~