1.4 Shifting, Reflecting, and Stretching Graphs
Day 1 and 2

I. **Common Functions**...see page 42 a through f

II. **Rigid Transformations**--Basic shape of graph is kept.

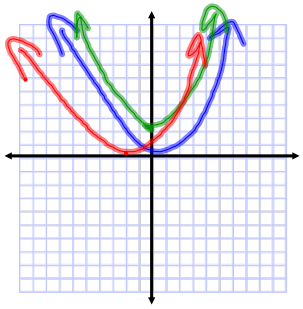
Let us explore...graph $y = x^2$

$y = x^2 - 1$

$y = x^2 + 3$

$y = (x - 2)^2$

$y = (x + 4)^2$



A) **Vertical and Horizontal shifts of f(x)**.

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3.
4.

Ex 1) Sketch the 3 graphs on the same axes.

$f(x) = x^2$, $g(x) = x^2 + 2$, $h(x) = (x + 2)^2$

B) Reflections of f(x).

1. Reflection in the x-axis: $h(x) = -f(x)$
2. Reflection in the y-axis: $h(x) = f(-x)$

Ex 2) Graph $y = -\sqrt{x}$ $y = \sqrt{-x}$ $y = -\sqrt{x} + 2$

Ex 3) Graph $y = x^4$. Write equations based on what I show you on the graphing calculator.

III. **Nonrigid Transformations**--graph is distorted/changed.

A. Vertical Stretch:
Vertical Shrink: **See other slide**

B. Horizontal Stretch:
Horizontal Shrink:

Ex 4) Describe the transformations if $g(x) = |x|$
$h(x) = 3|x|$

$r(x) = .2|x|$ **See next slide**

$f(x) = |3x|$

$u(x) = |(1/7)x|$

Ex 4) Describe the transformations if g(x) = |x|

h(x) = 3|x| vertical stretch * ycoord. by 3

r(x) = .2|x| vertical shrink * ycoord. by 0.2

f(x) = |3x| horizontal shrink * xcoord. by $\frac{1}{3}$

u(x) = |(1/7)x| horizontal stretch * xcoord. by 7

Ex 5) Compare the graph of the function with f(x) = $\sqrt{x}$.

A) y = $2\sqrt{x - 3}$ -3: horizontal shift (3 units to right)
2: Vertical stretch (* ycoord. by 2)

B) y = $-\sqrt{(5x)} + 4$

5: horizontal shrink (* xcoord. by $\frac{1}{5}$)
-: reflect over x-axis
4: vertical shift (4 units up)

Ex 6) Compare the graph of the function with $f(x) = x^3$.

A. $g(x) = -(x - 1)^3$

-1: horizontal shift (1 unit right)

-: reflect over x-axis

B. $p(x) = -5(x + 2)^3 - 8$

2: horizontal shift (2 units left)

5: vertical stretch (* y coord. by 5)

-: reflect over x-axis

-8: vertical shift (8 units down)