

ALGEBRA RH

Essential Question: What are transformations and how can we apply them to functions? **Day 2**

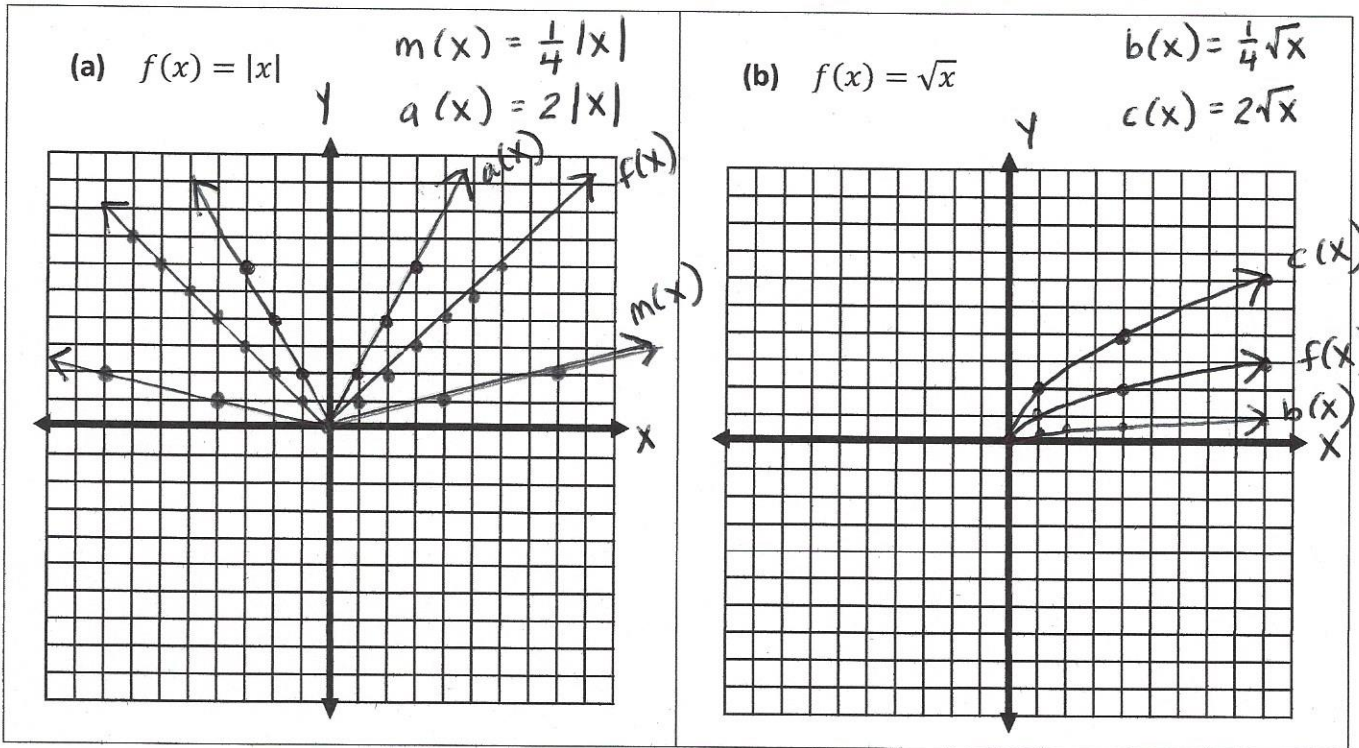
Do Now:

Given a function $f(x)$, describe the transformation if $g(x) = f(x - r) + s$
 horizontal shift r units to the right
 vertical shift s units up
 affects the x values
 affects the y values

Today we are going to learn how to **Stretch/Compress and Reflect** functions.

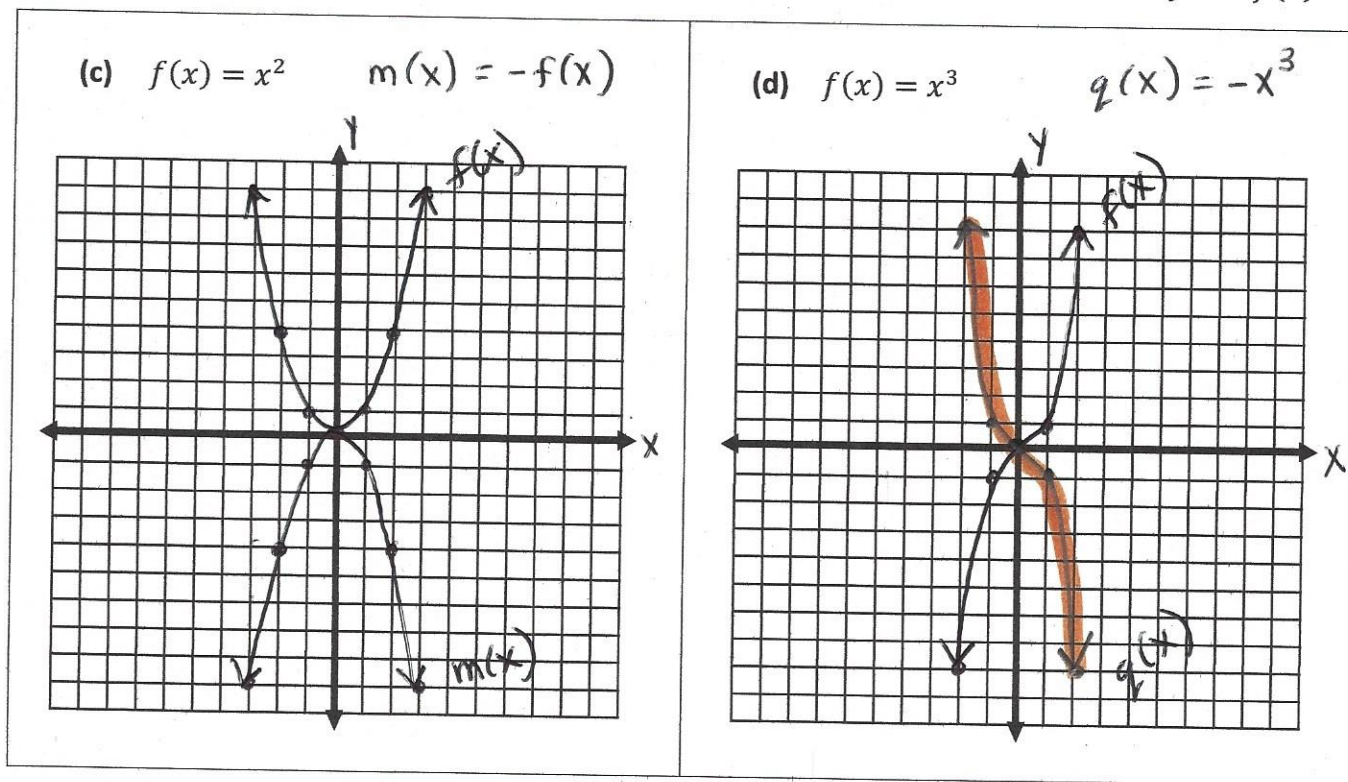
A stretch/compression or reflection happens when we multiply values to our given parent function.

- In the same coordinate plane, graph the parent function $f(x)$ and the new functions $y = a \cdot f(x)$ for $a = \frac{1}{4}$ and $a = 2$



Function Notation	Type of transformation
$a \cdot f(x)$ if $a > 1$	vertical stretch by a factor of "a"
$a \cdot f(x)$ if $0 < a < 1$	vertical compression by a factor of "a"

2. In the same coordinate plane, graph the parent function $f(x)$ and the new function $y = -f(x)$



Function Notation	Type of transformation
$-f(x)$	reflection over the x-axis

Practice Problem Set

1. Given the function $f(x)$ and $g(x) = 3f(x) + 6$, describe the transformation.

vertical stretch by a factor of 3 vertical shift up 6 units

2. Given the function $f(x)$ and $g(x) = -\frac{1}{3}f(x-1) - 2$, describe the transformation.

reflection over x-axis, vertical compression by a factor of $\frac{1}{3}$
horizontal shift right 1 unit, vertical shift down 2 units

3. Given the function $f(x) = \sqrt{x}$ and $g(x) = -5\sqrt{x}$, determine if they will have the same domain and range. Explain your answer.

same domain $x \geq 0$ not the same range.

Looking at the graph or table of values, range of $f(x)$ is $y \geq 0$

* 4. Given the function $y = |x-3| + 2$, describe the transformation to the new function $y = |x-5| - 1$ range of $g(x)$ is $y \leq 0$

Hint: write the turning point of the 1st function
determine the changes needed to get to the turning point
of the second function

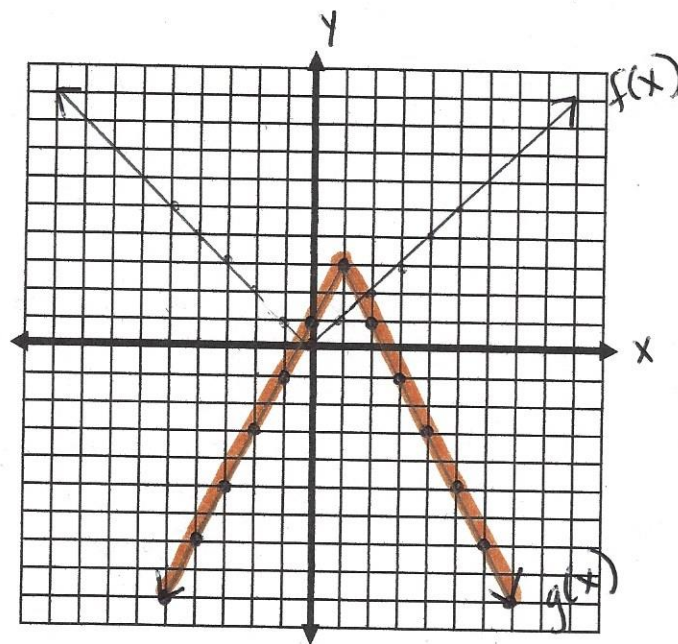
$(3, 2) \rightarrow (5, -1)$

add 2 to x value, subtract 3
from y value

horizontal shift right 2 units
vertical shift down 3 units

5. On the set of axes, graph both functions. Describe the transformation from the parent function.

$$f(x) = |x| \quad \text{and} \quad g(x) = -2|x - 1| + 3$$



↓
 reflection over x-axis
 vertical stretch
 by a factor of 2
 horizontal shift
 right 1 unit
 vertical shift
 up 3 units

TRANSFORMATION RULES FOR FUNCTIONS

EQUATION	HOW TO OBTAIN THE GRAPH
$y = f(x) + k$	vertical shift up "k" units
$y = f(x) - k$	vertical shift down "k" units
$y = f(x + h)$	horizontal shift left "h" units
$y = f(x - h)$	horizontal shift right "h" units
$y = af(x) \ (a > 1)$	vertical stretch by a factor of "a"
$y = af(x) \ (0 < a < 1)$	vertical compression by a factor of "a"
$y = -f(x)$	reflection over the x-axis