

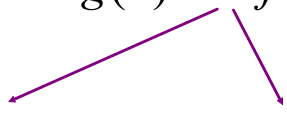
Section 1.8 - Transformations of Parent Functions

Learning Goal:

By the end of today, I will be able to recognize and apply transformations to a parent function.

Sep 16-10:25 PM

Summary of leading coefficient behaviour:

$$g(x) = a f(x)$$


Size of a -if $a > 1$, this is a vertical stretch-if $0 < a < 1$, this is a vertical compressionSign of a -if a is positive, the parabola opens up (no reflection)-if a is negative, the parabola opens down (reflection in x -axis)

Note: $f(x)$ is the base function or parent function

Confirm using graphing technology:

$$y = 2x^2 \quad y = 0.2x^2 \quad y = -3x^2$$

Apr 20-10:28 AM

Summary of adding/subtracting
behaviour (outside of parent function):

General Rule

$$g(x) = f(x) + k$$

$k > 0$, translates UP "k" units (positive) $k < 0$, translates DOWN "k" units (negative)

Confirm Using Graphing Technology

$$f(x) = \frac{1}{x}$$

$$y = f(x) + 5$$

$$f(x) = \sqrt{x}$$

$$y = f(x) - 3$$

Nov 24-9:11 AM

Summary of adding/subtracting behaviour
(INSide of the parent function):

General Rule

$$g(x) = f(x - (h))$$

$h > 0$, translates RIGHT "h" units (positive) $h < 0$, translates LEFT "h" units (negative)

****Watch for the double negatives****

$$f(x) = \frac{1}{x}$$

$$y = f(x + 3)$$

$$f(x) = |x|$$

$$y = f(x - 4)$$

Nov 24-9:14 AM

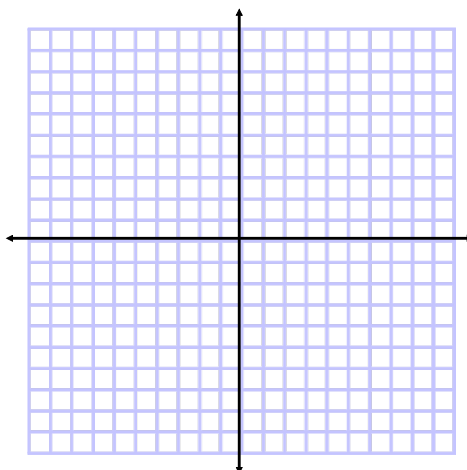
Transformation Difficulties

- linear can be difficult to tell which has been transformed
- quadratic can be difficult to tell which has been stretched or compressed

$$y = 3x$$

$$y = x - 4$$

$$y = (2x)^2$$



Sep 12-11:28 AM

Describe the transformation for the following:
(use up, down, left and right - verify with graphing technology)

$$y = |x| + 8$$

$$y = -0.1(x - 3)^2 - 5$$

$$y = \frac{5}{x + 7}$$

$$y = -6\sqrt{x + 1} - 3$$

$$y = (2x - 8)^2 + 3$$

Nov 25-2:22 PM

When all of the transformations are applied to the parent curve, the result can be summarized as follows:

$$y = a f(b(x-h)) + k$$

Describe the transformations of the following, then graph using technology:

$$f(x) = \frac{-3}{(2x-8)} + 5$$

Apr 26-11:39 AM

Final thoughts for transformations:

1. ORDER matters - tradition is to apply transformations from left to right, or by following BEDMAS

- up 5, reflect about x axis

vs

- reflect about x axis, up 5

2. horizontal stretches/compressions MUST be factored inside the function to accurately see the left/right translation

$$y = \sqrt{3x+12} \qquad y = \frac{1}{-x-8}$$

Sep 10-11:23 PM

Graphing Strategies

Steps to graph:

1/ Graph the parent function $f(x)$

2/ Apply the stretch/compression transformation.

3/ Apply the reflection transformation.

4/ Translate left/right and up/down.

(each transformed graph is essentially a "new" function)

$$z(x) = af(b(x-h))^2 + k$$

vertical stretch/
compression
reflection (points to a)
 vertical stretch/
compression
reflection (points to b)
 move left or right (points to h)
 move up or down (points to k)

Apr 21-12:47 PM

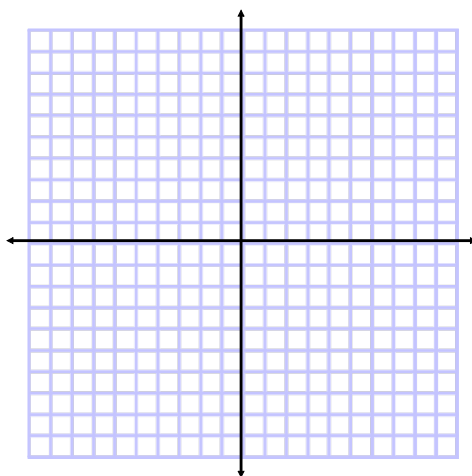
Graph

$$z(x) = -3(x+5)^2 + 1$$

Step 1 - graph $f(x) = x^2$

Step 2 & 3
-reflect and stretch to create $g(x)$
ie multiply y values by -3

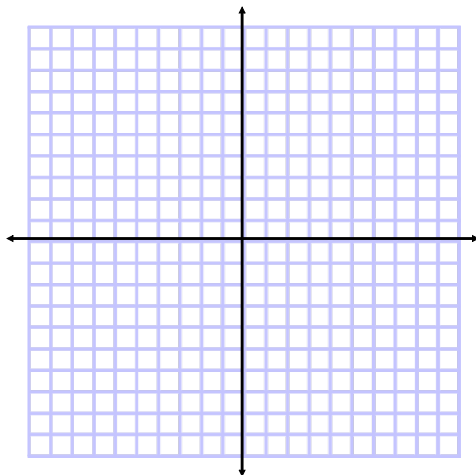
Step 4 -translate (move) the
graph 5 units left and 1 unit up
to create $z(x)$



Nov 24-2:50 PM

Graph

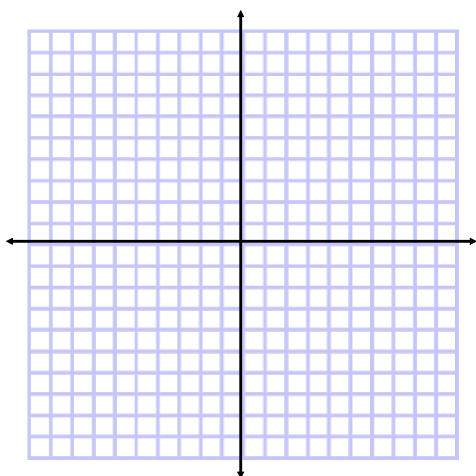
$$y = 2|4x - 12| - 5$$



Nov 24-2:50 PM

Graph

$$y = \frac{-0.5}{x - 6} + 4$$



Nov 24-2:50 PM

Creating New Function Expressions

Apply the following transformations to $f(x) = x^2$

(i) translate up 5 units

(ii) right 3 units

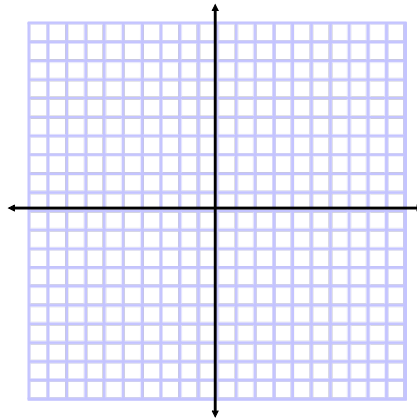
$$f(x) = (x)^2$$

$$g(x) = f(x) + 5$$

$$g(x) = x^2 + 5$$

$$z(x) = g(x - 3)$$

$$z(x) = (x - 3)^2 + 5$$



$$y = -\frac{3}{4}(x + 2)^2 + 3$$

Apr 30-11:42 AM

Creating New Function Expressions

Apply the following transformations to $f(x) = \sqrt{x}$

(i) vertically stretch by 3

(ii) left 4 units

(iii) down 2 units

$$f(x) = \sqrt{x}$$

$$g(x) = 3f(x)$$

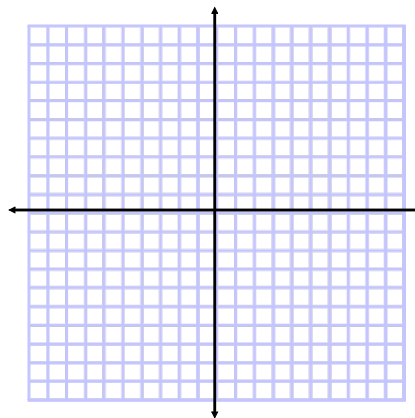
$$g(x) = 3\sqrt{x}$$

$$h(x) = g(x + 4)$$

$$h(x) = 3\sqrt{x + 4}$$

$$z(x) = h(x) - 2$$

$$z(x) = 3\sqrt{x + 4} - 2$$



Apr 30-11:42 AM

Homework

Pg. 70-72 #1-4, 6, 7-9ac

Next Day

Pg. 71 #10-12, 18,19

Sep 10-11:36 PM