Alg2/Trig

**Transformations of Parent Functions INVESTIGATION**

Today you’re going to discover how all functions behave under transformations. Let’s start out by graphing the parent functions we will be using.

1. Graph the following parent functions.

a. y = x b. y = x2 c. y = |x| d. y= 

*Part A- Shifting Our Thinking*

2. Using desmos.com or a graphing calculator, graph y = x2 and y = (x-3)2

Sketch the graph of y = (x-3)2 at right.

a. How does the graph compare to the graph of the parent function?

3. Using desmos.com or a graphing calculator, graph y = x2 and y = (x+4)2

Sketch the graph of y = (x+4)2 at right.

a. How does the graph compare to the graph of the parent function?

4. Using desmos.com or a graphing calculator, graph y = x2 and y = x2 + 3.

Sketch the graph of y = x2 + 3 at right.

a. How does the graph compare to the graph of the parent function?

5. Using desmos.com or a graphing calculator, graph y = x2 and y = x2 - 2.

Sketch the graph of y = x2 -2 at right.

a. How does the graph compare to the graph of the parent function?

6a. Predict how the graph of y = (x+1)2 + 4 will compare to the graph of y = x2. Write down your prediction!

b. Graph y = (x+1)2 + 4 using desmos.com or a calculator. Was your prediction correct? What happened?

7a. Predict how the graph of y = |x - 5|+ 2 will compare to the graph of y = |x|. Write down your prediction!

b. Graph y = |x-5|+ 2 using desmos.com or a calculator. (To graph absolute value on a calculator, go to MATH, tap to the right to go to NUM, and then select “1:abs(“. Was your prediction correct? What happened?

8a. Predict how the graph of y =  will compare to the graph of y = . Write down your prediction!

b. Graph y =  using desmos.com or a calculator. Was your prediction correct? What happened?

**Part A-Conclusions**

a. How will the graph of y = f(x + 3) compare to the graph of y = f(x)?

b. How will the graph of y = f(x – 2) compare to the graph of y = f(x)?

c. How will the graph of y = f(x) + 4 compare to the graph of y = f(x)?

d. How will the graph of y = f(x) – 5 compare to the graph of y = f(x)?

**Part B-** *Reflecting on a New Type of Transformation*

 Sketch a graph of y = $\sqrt{x}$ at right. Actual

1. Using desmos.com or a calculator, graph $y=- \sqrt{x}$ . Sketch the graph at right. Actual

How does the graph compare to the graph of the parent function?

1. Using desmos.com or a calculator, graph y $=\sqrt{-x}$ . Sketch the graph at right. Actual
How does the graph compare to the graph of the parent function?
2. Make a prediction. What will the graph $y=-\sqrt{-x}$ look like? Prediction Actual

Using technology, graph $y=-\sqrt{-x}$ . Sketch the graph at right.

How does the graph compare to the graph of the parent function?

1. Predict what the graph of $ y=-x^{2}$ will look like. Prediction Actual

Using technology, graph $y=-x^{2}$ . Sketch the graph at right.
How does the graph compare to the graph of the parent function?

1. Predict what the graph of $ y=(-x)^{2}$ will look like. Prediction Actual

Using technology, graph $y=(-x)^{2}$ . Sketch the graph at right.
How does the graph compare to the graph of the parent function?

Why does this happen???

6. Predict what the graph of $y=-\left(x-2\right)^{2}$ + 4 will look like. Prediction Actual

Using technology, graph $y=-\left(x-2\right)^{2}$ + 4 . Sketch the graph at right.

 How does the graph compare to the graph of the parent function y = x2?

7. Predict what the graph of $y=-\sqrt{x-3 }+2$ will look like. Prediction Actual

Using technology, graph $y=-\sqrt{x-3 }+2$ . Sketch the graph at right.
How does the graph compare to the graph of the parent function y= ?

8. Predict what the graph of $y=\sqrt{-(x-3) }+2$ will look like. Prediction Actual

Using technology, graph $y=\sqrt{-(x-3) }+2$ . Sketch the graph at right.
How does the graph compare to the graph of the parent function y= ?

Part B-Conclusions

a. How will the graph of y = -f(x) compare to the graph of y = f(x)?

b. How will the graph of y = f(-x ) compare to the graph of y = f(x)?

c. How does the graph of y = -|x+2|+3 compare to its parent function of y = |x|?

**Part C-** *Stretching Our Understanding of Transformations*

1. Using desmos.com or a calculator, graph both $y=x^{2}$ and y = 2x2. Sketch both graphs at right.

How does the graph compare to the graph of the parent function?

2. Using desmos.com or a calculator, graph both $y=x^{2}$ and y = 3x2. Sketch both graphs at right.

How does the graph compare to the graph of the parent function?

3. Using desmos.com or a calculator, graph both $y=x^{2}$ and y = x2. Sketch both graphs at right.

How does the graph compare to the graph of the parent function?

4. Using desmos.com or a calculator, graph both $y=x^{2}$ and y = x2. Sketch both graphs at right.

How does the graph of y = x2  compare to the graph of the parent function?

5. Predict what the graph of $y=|4x|$ will look like. Prediction Actual

Using technology, graph $y=\left|x\right|$ and y = |4x|. Sketch both at right.

How does the graph of y = |x| compare to the graph of the parent function?

5. Predict what the graph of $y=|\frac{1}{4}x|$ will look like. Prediction Actual

Using technology, graph $y=\left|x\right|$ and $y=|\frac{1}{4}x|$. Sketch both at right.

How does the graph of $ y=|\frac{1}{4}x|$. compare to the graph of the parent function?

**Part C- Conclusions**

Multiplying either the input by a number, y=f(3x) for example, or the output by a number, y = 3f(x), are both examples of dilations. Dilations are stretches; proportional shrinks or enlargements.

Dilations are more difficult to identify because a stretch vertically could also be represented by a horizontal compression.

