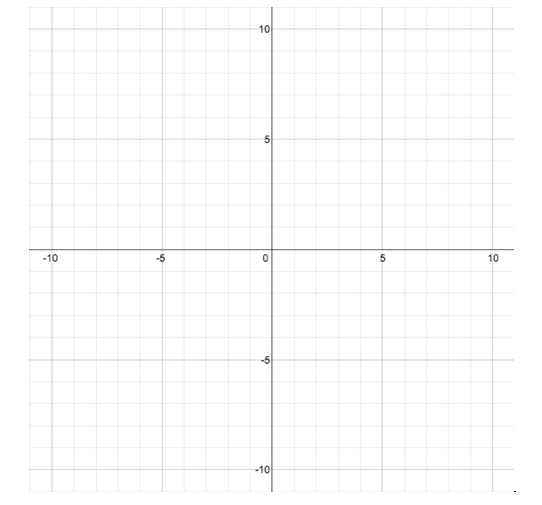
Lesson 20: Stretching and Shrinking Graphs of Functions

Classwork

Opening Exercise

The graph of a quadratic function defined by has been translated units to the left and units up. What is the formula for the function, , depicted by the translated graph?

Sketch the graph of the equation .

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Example

Exploratory Challenge

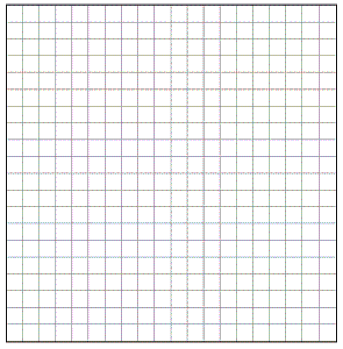
Complete the following to review Module 3 concepts:

* 1. Consider the function . Complete the table of values for . Then, graph the equation on the coordinate plane provided for part (b).

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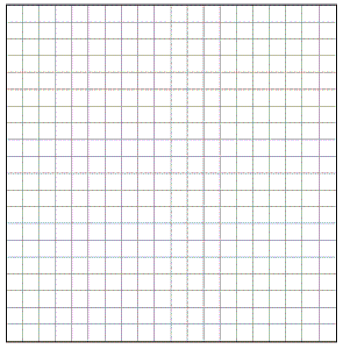
* 1. Complete the following table of values for each transformation of the function . Then, graph the equations *, , , and*  on the same coordinate plane as the graph of *.* Label each graph.

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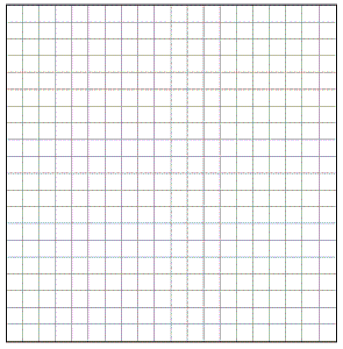


* 1. Describe how the graph of relates to the graph of for each case.

     2. 1
  2. Describe the transformation of the graph of that results in the graphs of , , and given the following formulas for each function. Then, graph each function and label each graph.



* 1. Consider the function .Complete the table of values; then graph the equation .



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* 1. Complete the following table of values, rounding each value to the nearest hundredth. Graph the equations *, ,* and on the same coordinate plane as your graph of above*.* Label each graph.

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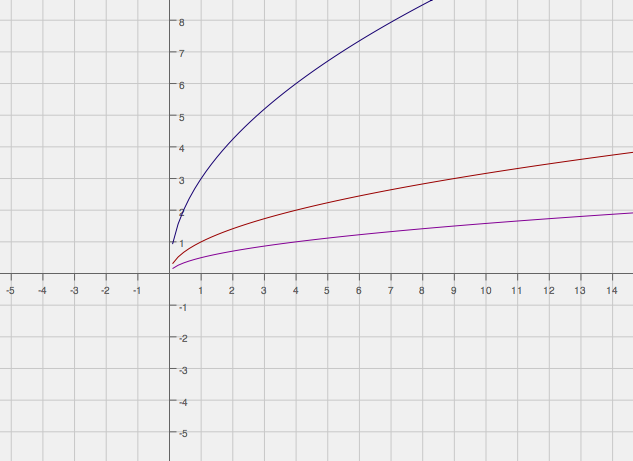
* 1. Describe the transformations of the graph of that result in the graphs of , , and .
  2. Describe how the graph of relates to the graph of for each case.

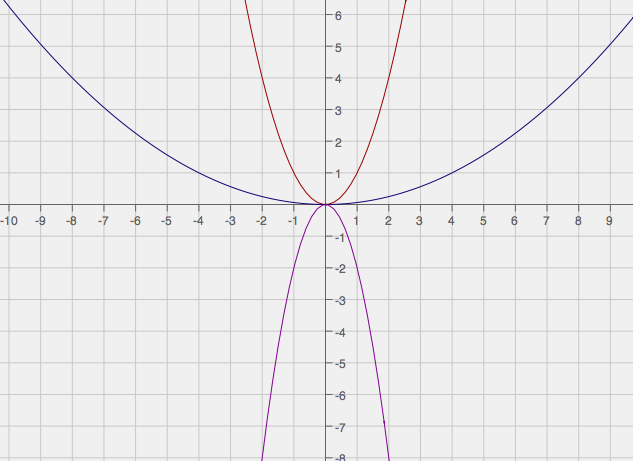
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Exercise 1

For each of the sets below, answer the following questions:

* What are the parent functions?
* How does the transformed graph relate to the graph of the parent function?
* Write the formula for the function depicted by the transformed graph.

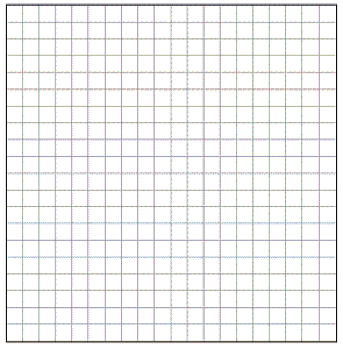


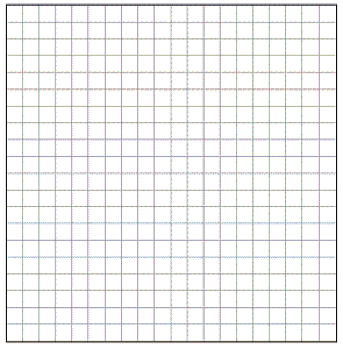
* 1. 

Exercise 2

Graph each set of functions in the same coordinate plane. Do not use a graphing calculator.

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Problem Set

1. Graph the functions in the same coordinate plane. Do not use a graphing calculator.
2. Explain how the graphs of functions and are related.
3. Explain how the graphs of functions and are related.
4. Write a function, ,in terms of another function, , such that the graph of is a vertical shrink of the graph by a factor of .
5. A teacher wants the students to write a function based on the parent function . The graph of is stretched vertically by a factor of and shrunk horizontally by a factor of . Mike wrote as the new function, while Lucy wrote . Which one is correct? Justify your answer.
6. Study the graphs of two different functions below. Which is a parent function? What is the constant value(s) multiplied to the parent function to arrive at the transformed graph? Now write the function defined by the transformed graph.

