

## SyMan Lesson 10: Transformations

In previous exercises, you worked with some of SyMan's basic graphing abilities. This exercise uses those skills to examine the topic of mathematical transformations.

As you follow along with the example below, be sure to read the explanation after each step. These explanations tell you why you are doing each step, and give further helpful advice. Does anybody ever bother to read this part? I doubt it.

**Step 1** Enter and graph  $y = \sqrt[3]{x} + 3\sqrt{x} + 4x$ . Sketch the graph of this function in the space below:

**Step 2** Pull down the "Variables" menu to the "Substitute" option. Click on the "x", then specify that you wish to substitute "x-1". In the space below, write down what the function becomes:

$y =$  \_\_\_\_\_

A transformation is the changing of one thing into another. In this case, you are telling SyMan to change every occurrence of the variable "x" into "x-1". This is usually written as  $x \rightarrow x-1$  (pronounced "x goes to x-1").

**Step 3** Graph the transformed equation. How does it compare to the original graph?

**Step 4** The transformed equation,  $y = \sqrt[3]{x-1} + 3\sqrt{x-1} + 4(x-1)$ , can be changed back into its original form by applying the opposite transformation. Since the original transformation was  $x \rightarrow x-1$ , the inverse transformation should be easy to guess. Use the "Substitute" option under the "Variables" menu to apply this transformation. You will have to simplify the result.

**Step 5** Clear the graph and re-graph the active equation (you shouldn't have to re-enter it if you applied the inverse transformation  $x \rightarrow x+1$  in step 4).

**Step 6** Apply the transformation  $x \rightarrow x+2$  and graph the resulting equation. How does the transformed equation compare to the original?

**Step 7** Apply an inverse transformation to return the equation to its original form (remember to simplify the result). Clear the display and re-graph the original equation.

**Step 8** What transformation should be applied to shift the graph 3 units to the right? Check your answer by applying the transformation and graphing the result. As well, state the inverse transformation.

$x \rightarrow$  \_\_\_\_\_ inverse:  $x \rightarrow$  \_\_\_\_\_

**Step 9** What transformation should be applied to shift the graph 2 unit to the left? What is the inverse of this transformation?

$x \rightarrow$  \_\_\_\_\_ inverse:  $x \rightarrow$  \_\_\_\_\_

**Step 10** Clear the display and re-graph the original equation, then apply the transformation  $x \rightarrow 2x$  to this function. Graph the result and describe how it compares to the original.

**When you have completed Steps 1 through 1, go on to answer the following questions:**

1.)

a)  $y = x^3$

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