

## Function Transformations Activity

### Overview

In this activity, students are introduced to **function transformations**. Specifically, they will investigate **dilation** and **translation** using the Transformations VI, a LabVIEW Virtual Instrument (VI). Students see how changes in the algebraic representation of a function are connected to graphical changes.

### Objectives

Students will be able to:

- Graph a transformed function
- Describe translations and dilations and how they impact a function and its graph

### Standards (TEKS)

Algebra 1: A.9

Algebra 2: 2A.4; 2A.6; 2A.7; 2A.8C; 2A.9A, B, C; 2A.11

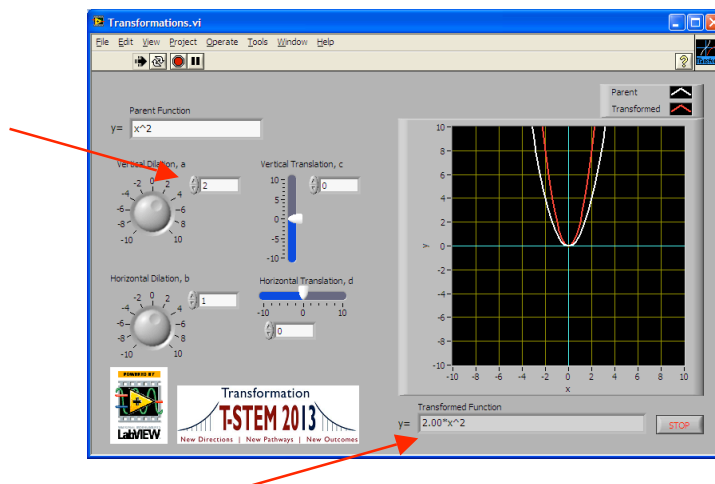
Geometry: G.7B, C

Precalculus: P.1A, B, C; P.2A

### Activity

A. Investigate **vertical dilation**.

- 1) Open and run the VI.
- 2) Notice that  $y = x^2$  is graphed, then enter “2” for the Vertical Dilation.



- i. Notice the change in the graph and the Transformed Function equation.

- 3) Play with the Vertical Dilation control.
  - i. What will happen if the Vertical Dilation is set to 3, 4, 1/2, or 1/3?
  - ii. Notice how the graph and Transformed Function change in unison to display the transformation of the function.
- 4) Now, change the Parent Function to “abs(x)” for  $y = |x|$  and see how this function’s graph and equation respond to vertical dilation.
- 5) Use the VI to graph these vertically dilated functions:
  - i.  $y = 7x^2$
  - ii.  $y = 0.4x^2$
  - iii.  $y = 3|x|$

**B. Investigate vertical translation.**

- 1) Play with the Vertical Translation control.
  - i. Use “x^2” as the Parent Function.
  - ii. Slide the Vertical Translation control up and down.
- 2) Try other parent functions.
  - i. Use “abs(x)” and “x” as Parent Functions.
  - ii. Slide the Vertical Translation control up and down.
- 3) Use the VI to graph these transformed functions:
  - i.  $y = x^2 - 1$
  - ii.  $y = x + 5$
  - iii.  $y = |x| + 3$
  - iv.  $y = 3x^2 - 2$

**C. Investigate horizontal translation.**

- 1) Play with the Horizontal Translation control.
  - i. Try out “x^2”, “abs(x)”, and “x” as Parents.
  - ii. Slide the Horizontal Translation control back and forth.
- 2) Use the VI to graph these transformed functions:
  - i.  $y = (x - 2)^2$
  - ii.  $y = (x + 3)^2$
  - iii.  $y = |x - 4|$
  - iv.  $y = 3(x + 1)^2 - 2$

**D. Consider the form  $y = a * f(x - d) + c$ . You investigated three transformations. Which transformation belongs to which constant,  $a$ ,  $b$ , or  $c$ , in the form?**