# Transformations of Functions 1

**Student Activity**

Name _____

Class _____

**Open the TI-Nspire document**
*Transformations_of_Functions_1.tns.*

This activity investigates some transformations of functions. The graph of a function $y = f(x)$ will be *translated.* You will be able to compare the new graph with the original to determine the impact of changes to the function on the graph.

> **1.1  1.2  2.1  ▶**  *Transforma...s_1* ▽
>
> **Transformations of Functions 1**
> _____
> Use the sliders to help you explore
> transformations on graphs of functions.

**Move to page 1.2.**

**Part One: $y = f(x) + k$.**

1.  Drag the point to change the value of *k.*

    a.  What happens to the graph of $y_2 = f(x) + k$ as the value of *k* changes?

    b.  Move the point so that $k > 0$. Where is the graph of $y_2 = f(x) + k$ compared to $y_1 = f(x)$?

    c.  Move the point so that $k < 0$. Where is the graph of $y_2 = f(x) + k$ compared to $y_1 = f(x)$?

    d.  Move the point so that $k = 0$. Where is the graph of $y_2 = f(x) + k$ compared to $y_1 = f(x)$?

2.  For each of the following statements, indicate if it is True or False, and explain why you think so.

    a.  When *k* is negative, the graph of $y_2 = f(x) + k$ is below the graph of $y_1 = f(x)$.

    b.  When *k* is positive, the graph of $y_2 = f(x) + k$ is below the graph of $y_1 = f(x)$.

    c.  There is a value of *k* that will make part of the graph of $y_2 = f(x) + k$ above the graph $y_1 = f(x)$ and the rest below the graph of $y_1 = f(x)$.
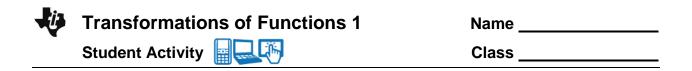
3.  The graph of $y_2 = f(x) + k$, when $k \neq 0$, is a *vertical shift* of the graph of $y_1 = f(x)$. Why does the graph shift vertically?

**Move to page 2.1.**

**Part Two: $y = f(x - h)$**

4.  Drag the point to change the value of $h$.
    a.  What happens to the graph of $y_2 = f(x - h)$ as the value of $h$ changes?

    b.  Move the point so that $h > 0$. Where is the graph of $y_2 = f(x - h)$ compared to $y_1 = |x|$?

    c.  Move the point so that $h < 0$. Where is the graph of $y_2 = f(x - h)$ compared to $y_1 = f(x)$?

    d.  Move the point so that $h = 0$. Where is the graph of $y_2 = f(x - h)$ compared to $y_1 = f(x)$?

5.  The graph of $y_2 = f(x - h)$, when $h \neq 0$, is a *horizontal shift* of the graph of $y_1 = f(x)$. Why does the graph shift horizontally?

6.  All of the functions on pages 1.2 through 3.1 were of the absolute value type. In other words, $y_1 = |x|$ and $y_2 = |x - h| + k$. How does the graph of $y_2 = |x - 2| - 1$ compare to the graph of $y_1 = |x|$? Use page 3.1 of the tns document on your handheld to help determine the transformations.

7.  The vertex of the absolute value graph function is where the graph turns back up or goes back down. What is the vertex of $y_2 = |x - 2| - 1$? Check with page 3.1.

8.  What is the vertex of $y_2 = |x + 3| + 4$? What is the vertex of $y_2 = |x - h| + k$?

9. Pages 4.1 and 5.1 use a different type of function. For each transformation in a, b and c, describe the changes in the graph of $y_1 = f(x)$ shown. Then sketch the graph of $y_2$.

Use pages 4.1 and 5.1 to check answers.

a. $y_2 = f(x-1)$

b. $y_2 = f(x)+2$

c. $y_2 = f(x-1)+2$