Algebra/Trig
Project:
Families of Graphs

After completing this activity, you should be able to represent your parent function as both a table and a graph, and describe how different kinds of transformations change both the table and the graph.

To start, write down your parent function: $f(x) =$ _____

Now enter the function into your graphing calculator. Press the [Y=] button on your calculator, and enter the function into $Y_1 =$. (Remember, $f(x)$ and y can be used interchangeably.)

Once you have the function entered into your calculator, we want to look at a table of x and y values for the function. Before we can do this, we want to make sure that the table in our graphing calculator is set properly.

Press the [2ND] button on your calculator, then press the [WINDOW] (TBLSET) button. This will take you into the table settings. Set both the Independent and Dependent variables to "Auto." Your screen should look like the screen pictured on the right.

Now we are ready to look at a table of values for our function. Press the [2ND] button on your calculator, then press the [GRAPH] (TABLE) button. You should see a table of values that compares the variable X to the variable Y_1.

Your table should look something like the picture on the right. Of course, depending on your function, your Y_1 values will be different.

X	Y1
-3	-5
-2	-4
-1	-3
0	-2
1	-1
2	0
3	1

X= -3

Remember, whenever we want to look at a ***table of values***, we should press the [2ND] (TABLE) button, then press the [GRAPH] button.

Whenever we want to look at a ***graph*** of our function, we should just press the [GRAPH] button. Make sure your window is zoomed to "ZStandard."

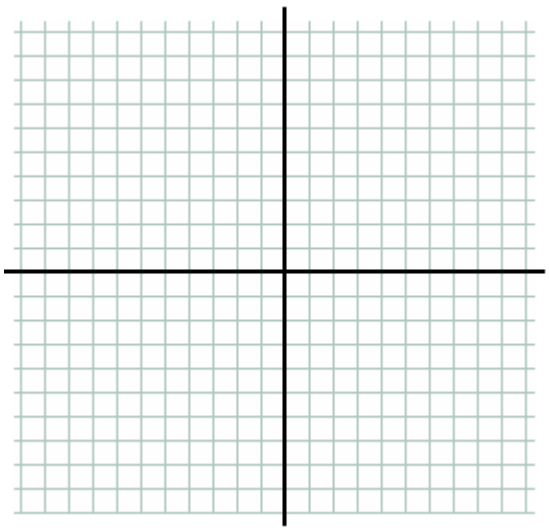
Copy the table of values for your parent function below. Graph those points on the coordinate plane below. Check to make sure that the graph you've drawn looks like the graph on your graphing calculator. (It is *very important* that you graph the points from your table; *do not* just copy the graph from your graphing calculator.)

Parent function: $f(x) =$ _____

Table

X	Y_1
-3	
-2	
-1	
0	
1	
2	
3	

Graph



The table and graph you have just drawn are your points of reference. These should be the focal points of your visual aid. You will compare all of the other tables and graphs in this project to the ones you have above.

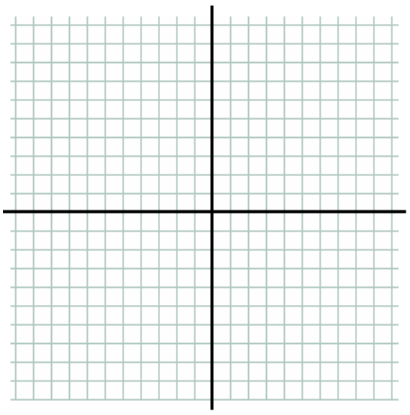
Reflections

Let's see what happens when we put a negative sign into the equation. There are two different ways we can do this. The first is to place a negative sign outside of our entire function. Put your entire function in parentheses, and place a negative sign to the left of it. For example, if your function is $f(x) = x + 5$, then $-f(x) = -(x + 5)$. Show your new table and new graph, and describe how they're different from your original table and graph.

New function: $-f(x) =$ _____

Table Graph Compare

X	Y_1
-3	
-2	
-1	
0	
1	
2	
3	

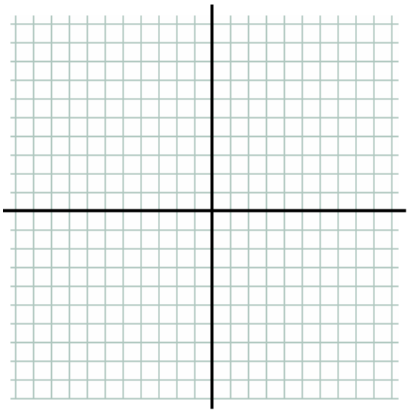


The second way to put a negative sign into the equation is to place a negative sign inside of our function. Instead of plugging in x, now we'll plug in $-x$. Don't forget to put parentheses around –x. You may need them. For example, if your function is $f(x) = x + 5$, then $f(-x) = (-x) + 5$. Show your new table and new graph, and describe how they're different from your original table and graph.

New function: $f(-x) =$ _____

Table Graph Compare

X	Y_1
-3	
-2	
-1	
0	
1	
2	
3	



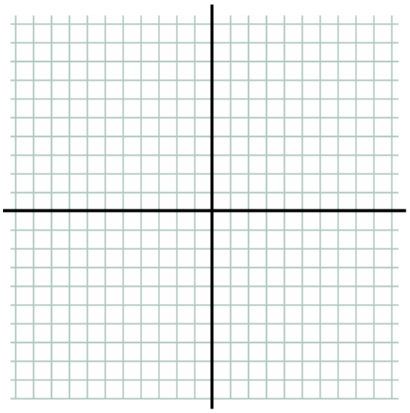
Translations

One way to translate a function is to add a number to it or subtract a number from it. Choose a whole number (I'd recommend keeping it small) and add it to your function. For example, your function might be $f(x) = 2x$, and you might choose to add 4 to it. Then $f(x) + c = 2x + 4$. Show your new table and new graph, and describe how they're different from your original table and graph.

New function: $f(x) + c =$ _____

Table Graph Compare

X	Y_1
-3	
-2	
-1	
0	
1	
2	
3	

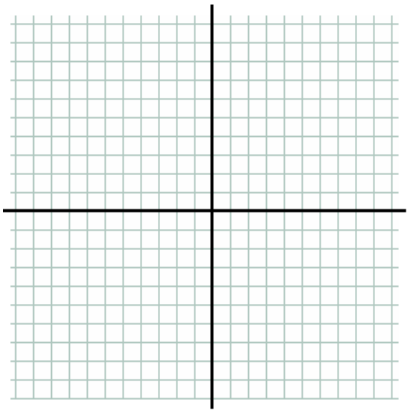


Now choose a whole number and subtract it from your function. For example, your function might be $f(x) = 4x$, and you might choose to subtract 3 from it. Then $f(x) - c = 4x - 3$. Show your new table and new graph, and describe how they're different from your original table and graph.

New function: $f(x) - c =$ _____

Table Graph Compare

X	Y_1
-3	
-2	
-1	
0	
1	
2	
3	



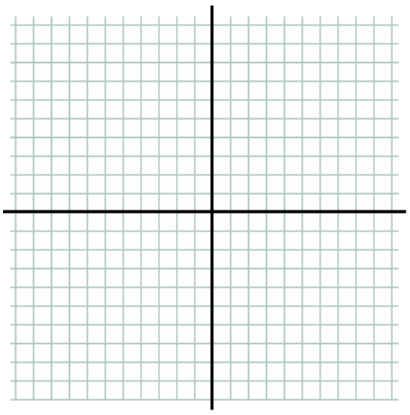
Translations (continued)

Another way to translate a function is to add a number to x or subtract a number from x. Choose a whole number and add it to the x in your function. For example, your function might be $f(x) = 2x$, and you might choose to add 4 to x. Then $f(x + c) = 2(x + 4)$. (Notice, this time we're adding 4 *inside* the parentheses; on the previous page, we were adding 4 *outside* the parentheses.) Show your new table and new graph, and describe how they're different from your original table and graph.

New function: $f(x + c) =$ _____

Table Graph Compare

X	Y_1
-3	
-2	
-1	
0	
1	
2	
3	

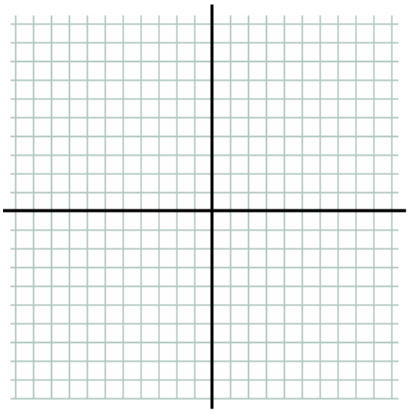


Now choose a whole number and subtract it from the x in your function. For example, your function might be $f(x) = 4x$, and you might choose to subtract 3 from x. Then $f(x - c) = 4(x - 3)$. Show your new table and new graph, and describe how they're different from your original table and graph.

New function: $f(x - c) =$ _____

Table Graph Compare

X	Y_1
-3	
-2	
-1	
0	
1	
2	
3	



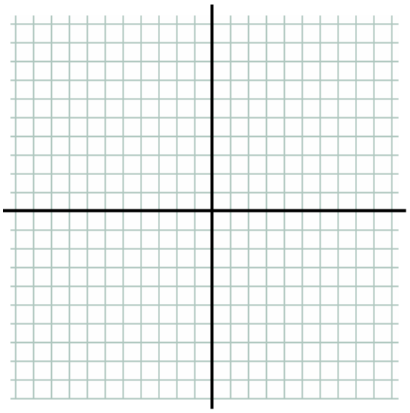
Dilations

Finally, let's see what happens when we multiply the equation by a number. Multiply your entire function by a whole number. Be sure to put your parent function in parentheses. Show your new table and new graph, and describe how they're different from your original table and graph.

New function: $a \cdot f(x) =$ _____

Table Graph Compare

X	Y_1
-3	
-2	
-1	
0	
1	
2	
3	

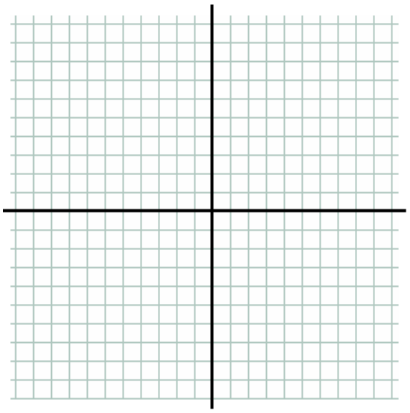


Now multiply your entire function by a positive fraction that is less than one. Again, remember to put your parent function in parentheses. Show your new table and new graph, and describe how they're different from your original table and graph.

New function: $a \cdot f(x) =$ _____

Table Graph Compare

X	Y_1
-3	
-2	
-1	
0	
1	
2	
3	



Bonus question: What would happen if you multiplied your function by a negative number? Is it still a dilation? Is it another type of transformation? Is it some combination?