**Activity 1.4.5 Transformations Made Easy (seriously)**

List the transformations in the following order (think order of operations).

1. Horizontal translation (parentheses/grouping symbols) – This is an x-value change
2. Vertical stretch – This is a y-value change
3. Reflection – This is also a y-value change
4. Vertical translation (addition/subtraction) – Yet another y-value change

It would be best if you went back to the Move It! and Stretch It! activities and think about what values were changing when k was an ***inside*** and ***outside*** value. If you look closely, the only time *k* had an effect on *x* was when *k* was an *inside* value. That being said, the other two locations of *k* had an effect on *y* in 3 different ways.

We can translate individual points without using a table of values. All we need is basic mental math, our favorite! 

1. **Action** - Add 2 to x **Reasoning** - Shifted right 2 units - Horizontal translation
2. **Action** - Multiply y by 3 **Reasoning** - Vertical Stretch by a factor of 3
3. **Action** - Change the sign of y **Reasoning** – Reflection across the x-axis
4. **Action** - Add 1 to y **Reasoning –** Shifted up 1 unit - Vertical translation

The parent graph is. Some ordered pairs are: (-4, 4), (-2, 2), (0, 0), (2, 2) and (4, 4). Let’s go through the transformations identified above with these points. The first two are done for you. After you have completed the chart, graph the two functions using the coordinates from the first and last columns.

**f(x)**  *add 2 to x multiply y by 3 reflect add 1 to y =* **g(x)**

(-4, 4) ( -2 , 4 ) ( -2 , 12 ) ( -2 ,-12) ( -2 ,-11)

(-2, 2) ( 0 , 2 ) ( 0 , 6 ) ( 0 , -6 ) ( 0 , -5 )

(0, 0) ( , ) ( , ) ( , ) ( 2 , 1 )

(2, 2) ( , ) ( , ) ( , ) ( , )

(4, 4) ( , ) ( , ) ( , ) ( , )

![[image]]()

Go through the next couple of examples on your own. Then we’ll regroup and see how we’re doing. Since we are just trying to check our arithmetic, we’ll just grab 3 points for now. Usually, we’d like to get 5 points for all graphs. You may need additional scrap paper to complete this assignment.

The first two problems are modeled for you.

**1.**  

**f(x)**  *subtract 3 from x mult y by*  *reflect add 4 to y =* **g(x)**

(-4, 4) ( , ) ( , ) ( , ) ( -7 , 2 )

(0, 0) ( , ) ( , ) ( , ) ( , )

(4, 4) ( , ) ( , ) ( , ) ( , )

**2.**  

**f(x)**  *add 4 to x mult y by 1 don’t reflect subtract 6 from y =* **g(x)**

(-2, 4) ( , ) ( , ) ( , ) ( , )

(0, 0) ( , ) ( , ) ( , ) ( , )

(2, 4) ( , ) ( , ) ( , ) ( , )

**3.**  

**f(x)**  *\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_=* **g(x)**

(0, 0) ( , ) ( , ) ( , ) ( , )

(4, 2) ( , ) ( , ) ( , ) ( , )

(9, 3) ( , ) ( , ) ( , ) ( , )

**4.**  

**f(x)**  *\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_=* **g(x)**

(0, 0) ( , ) ( , ) ( , ) ( , )

(4, 2) ( , ) ( , ) ( , ) ( , )

(9, 3) ( , ) ( , ) ( , ) ( , )

**5.**  

**f(x)**  *\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_=* **g(x)**

(-3, -27) ( , ) ( , ) ( , ) ( , )

(0, 0) ( , ) ( , ) ( , ) ( , )

(3, 27) ( , ) ( , ) ( , ) ( , )

**6.**  

**f(x)**  *\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_=* **g(x)**

(-3, 9) ( , ) ( , ) ( , ) ( , )

(0, 0) ( , ) ( , ) ( , ) ( , )

(3, 9) ( , ) ( , ) ( , ) ( , )

**FAQ’s**

**“How do you decide which points to use?”**

Use the function reference sheet to identify the typical coordinates from the parent function. If there is a vertex, use that point and two points from either side of the vertex of your choice. I suppose the two points I would choose are values that work well for output values of y. I mean, I am trying to avoid non-integer values. If the stretch/compression factor is ½, then use the coordinates that have even y values if possible. Work smart, not hard!

**“ I don’t get it”**

What part? You need to move beyond universal SOS messages like that. Try asking someone at your table to explain it to you. When you work as a team, everyone learns the material a little better. Perhaps go back to an example that we have already done (we just did three) and walk yourself through the arithmetic again.

**“How do you know what value of the coordinate pair changes?”**

Simple, the x value is only changed by the horizontal shift, if there is one, the rest are y-value changes in the order you would normally approach them by order of operations; multiplication first, then addition or subtraction.