

Exploring Families of Functions

Through completing this activity, you will explore the effects of altering values within various functions on the graph of the function. You will also be able to generalize, so that you do not have to graph every function you will encounter in the future to observe how it has transformed from its parent graph! 😊

⇒ **General Function Notation:** $f(x)$

⇒ **Transformed Function Notation:** $A*(f(Bx + C)) + D$

• A, B, C, and D are real numbers whose values will affect how the graph of $f(x)$ is transformed.

Your Assigned Function: _____

★ **EFFECTS OF A:** Explore... $A*f(x)$

Set $A = 1$, $B = 1$, $C = 0$, and $D = 0$.

Then change A to negative 1. How does the graph transform?

Now set A back to positive 1.

Choose a value for A that is greater than one, and record your value here: _____.

How does this compare to when $A = 1$?

Now set A back to positive 1.

Choose a value for A that is between zero and one (a fraction), and record your value here: _____.

How does this compare to when $A = 1$?

★ **EFFECTS OF B:** Explore... $*f(B*x)$

Set $A = 1$, $B = 1$, $C = \text{any nonzero number}$, and $D = 0$.

Now change B to negative one. How does this transform the graph?

★ **EFFECTS OF C:** Explore... $f(x+C)$

Set $A = 1$, $B = 1$, $C = 0$, and $D = 0$.

Choose an integer value for C that is greater than zero, and record your value here: _____.
How does this compare to when $C = 0$?

Choose an integer value for C that is less than zero, and record your value here: _____.
How does this compare to when $C = 0$?

★ **EFFECTS OF D:** Explore... $f(x) + D$

Set $A = 1$, $B = 1$, $C = 0$, and $D = 0$.

Choose an integer value for D that is greater than zero, and record your value here: _____.
How does this compare to when $D = 0$?

Choose an integer value for D that is less than zero, and record your value here: _____.
How does this compare to when $D = 0$?

*Now, find at least one of your peers who was assigned a different function than you! Compare and contrast your results. What generalizations can you make regarding how the values of A , B , C , and D affect the graph of any parent function?

A:

B:

C:

D:

Describe each transformation of the parent function.

1. $y = -(x + 1)^2 - 3$

2. $m(x) = \frac{1}{2}|x - 3| + 1$

3. $f(x) = -\ln(x + 4) - 3$

4. $w(x) = 2(-x - 3)^3 + 9$

Write an equation for the function in each situation.

1. The parent absolute value function is reflected over the y-axis, and translated 3 units up.

2. The parent cubic function translates right 7 units and down 9 units.

3. The parent exponential function reflects over both the x and y axes.