Name: _____ Date: _____ **Unit 1 Class Work**

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

- B cannot equal 0.
- 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:**

Set B = 1, C = 0, and D = 0. Then manipulate the value of A, and record your observations in the table below.

When A is positive…	When A is negative…	As |A| increases…	As |A| decreases…

Change B, C, and D to any non-zero numbers. Manipulate A as you did earlier. Does A's value still have the same effects on the graph? If so, keep your chart and move on. If not, add to your chart and then move on.

★ **EFFECTS OF B:**

Set A = 1, C = 0, and D = 0. Then manipulate the value of B, and record your observations in the table below.

When B is positive…	When B is negative…

Change A, C, and D to any non-zero numbers. Manipulate B as you did earlier. Does B 's value still have the same effects on the graph? If so, keep your chart and move on. If not, add to your chart and then move on.

★ **EFFECTS OF C:**

Set A = 1, B = 1, and D = 0. Then manipulate the value of C, and record your observations in the table below.

As C increases…	As C decreases…

Change A, B, and D to any non-zero numbers. Manipulate C as you did earlier. Does C's value still have the same effects on the graph? If so, keep your chart and move on. If not, add to your chart and then move on.

★ **EFFECTS OF D:**

Set A = 1, B = 1, and C = 0. Then manipulate the value of D, and record your observations in the table below.

As D increases…	As D decreases…

Change A, B, and C to any non-zero numbers. Manipulate D as you did earlier. Does D's value still have the same effects on the graph? If so, keep your chart and move on. If not, add to your chart and then move on.

✻ 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?

Describe each transformation of the parent function.

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

2. $f(x) = |x - 3| + 1$

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Families of Functions Practice

Directions:

- Sketch and name the parent function.	*- Sketch and describe the transformed function.*
1. $y = x$	$y = x + 3$
2. $f(x) = 1/x$	$f(x) = 1 / (x - 3)$
3. $y = \|x\|$	$y = 2\|x\| - 3$
4. $f(x) = c$	$f(x) = 5$
5. $y = x$	$y = (x + 2) - 6$
6. $f(x) = \|x\|$	$f(x) = -\| x - 2\|$
7. $y = 1 / x^2$	$y = 1/x^2 - 5$
8. $f(x) = c$	$f(x) = -1$
9. $y = x^2$	$y = -3(x + 1)^2$
10. $y = \sqrt{x}$	$y = -\sqrt{(x - 1)} + 4$
11. $y = x^2$	$y = \frac{1}{2}x^2 - 1$
12. $f(x) = \sqrt{x}$	$f(x) = \sqrt{(-x + 3)}$
13. $y = \ln x$	$y = \ln(x - 2) + 1$
14. $y = e^x$	$y = e^{-x} - 2$
15. $f(x) = 1/x^2$	$f(x) = 1/x^2 - 3$
16. $y = x^3$	$y = -(x+1)^3$
17. $f(x) = \sqrt{x}$	$f(x) = \sqrt{-x} + 3$

Write an equation for each function described below.

18. Square root function shifted 2 units right and 1 unit down: _____

19. Cubic function shifted left 5 units and up 3 units: _____

20. Linear function shifted up 11 units: _____

21. Quadratic function shifted 4 units up and 9 units left: _____

22. Absolute value function reflected over the x-axis, and shifted 2 units right: _____

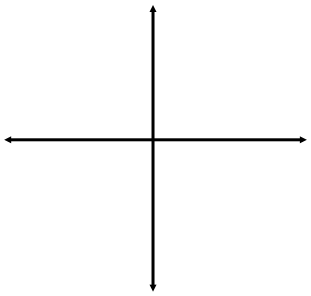
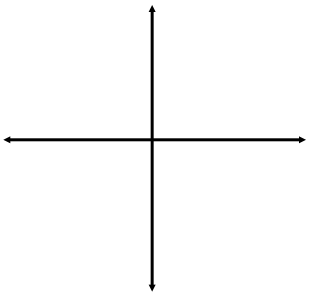
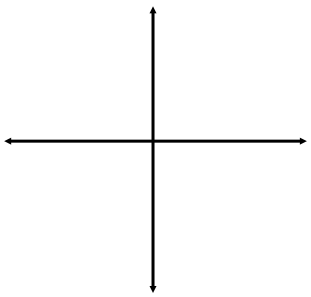
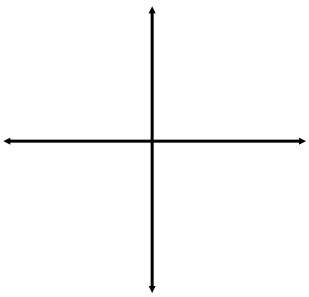
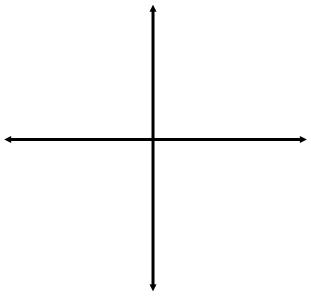
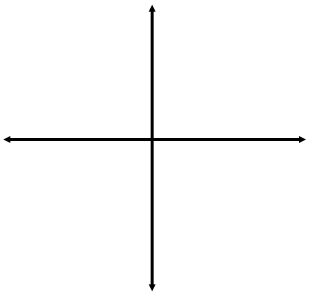
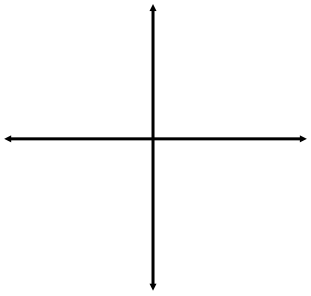
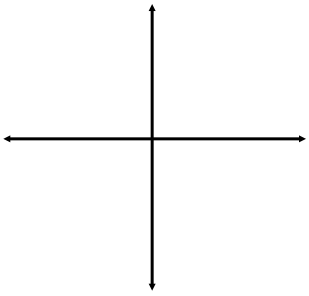
23. Absolute value function reflected over the y-axis and shifted 3 units left and 1 unit up: _____

24. Logarithmic function reflected over both the x and y axis and translated 2 units down: _____

25. Quadratic function reflected over both axis, and shifted 3 units left and 1 unit up: _____

26. Square root function reflected over the x-axis, stretched by a factor of 2, and shifted 5 units right:

_____

1. 	
2. 	
3. 	
4. 	

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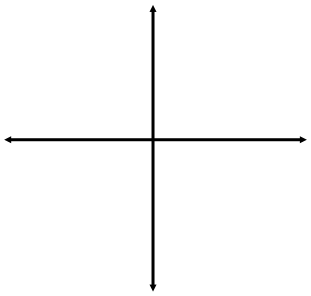
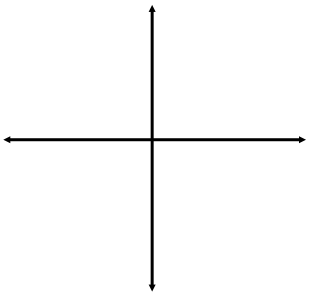
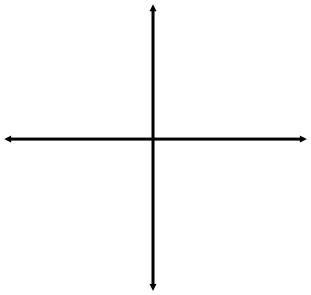
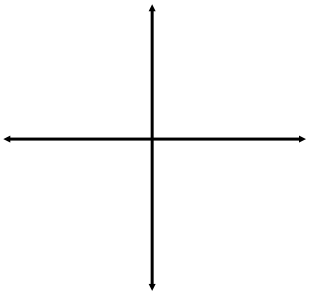
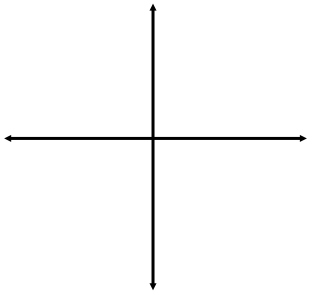
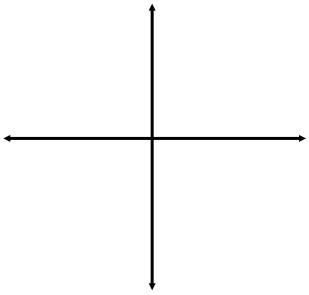
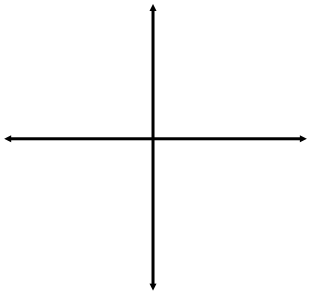
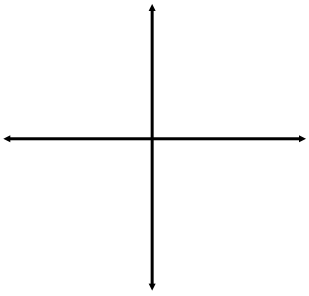
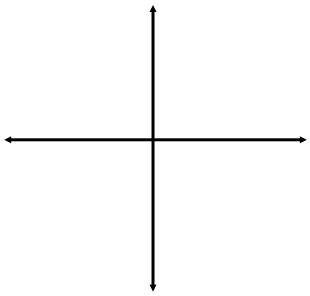
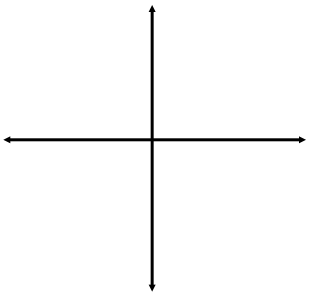
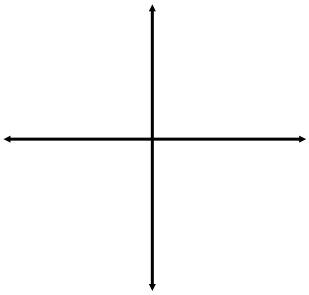
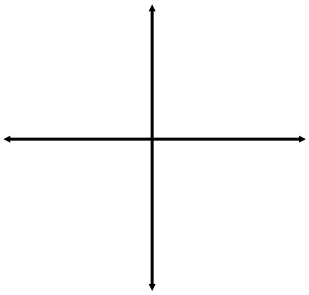
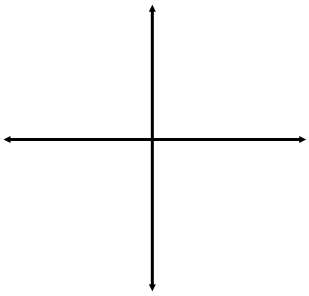
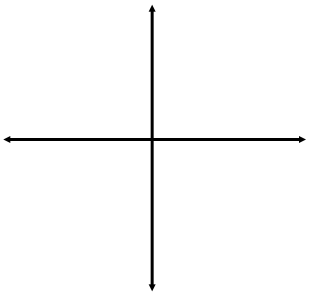
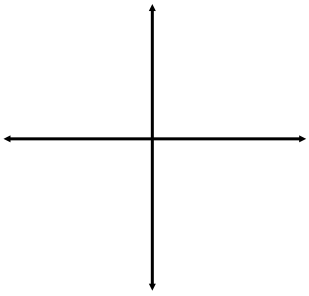
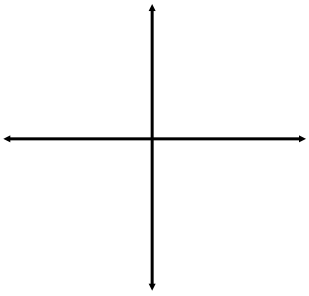
 5.	
 6.	
 7.	
 8.	

9. 	
10. 	
11. 	
12. 	

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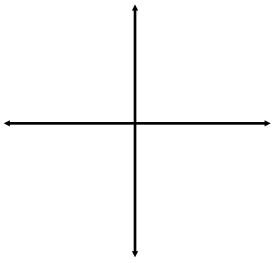
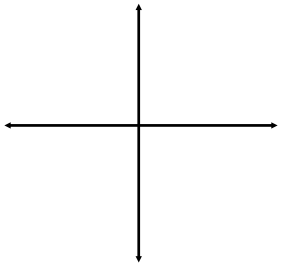
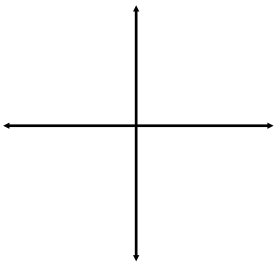
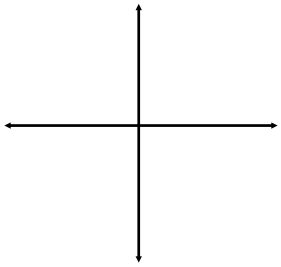
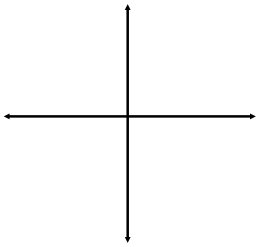
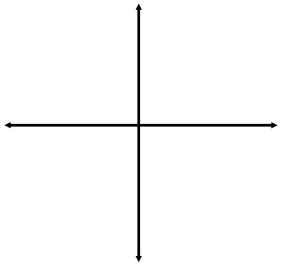
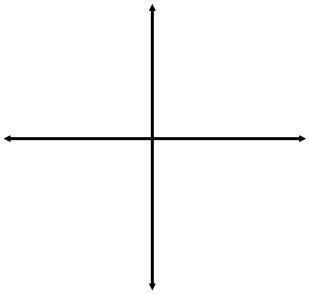
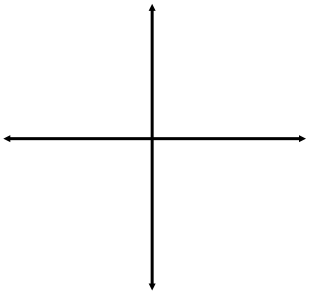
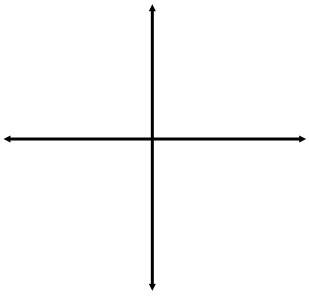
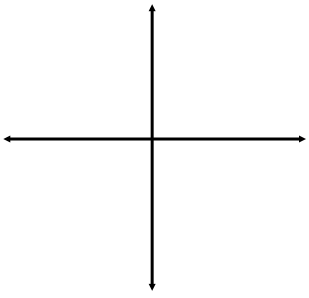
 13.	
 14.	
 15.	
 16.	
 17.	

Closure For Activity:

Describe how the graph of the function $f(x) = x^2$ can be transformed to the function:

*** If your first name begins with A – M:**

$$f(x) = -(x + 3)^2 - 9$$

*** If your first name begins with N – Z:**

$$f(x) = (-x - 4)^2 + 1$$

Then, find someone who had the other function, and share. ☺

Closure For Practice:

POST A TWEET & FAVORITE

On a post-it, write your answer response to either option. Then post it on the wall, and star your favorite! ☺

OPTION A: Transforming functions is like

_____ because

_____.

OPTION B: Create a rhyme, short poem, or song to highlight any of the transformation rules.