

Algebra 2
2-6 Families of Functions

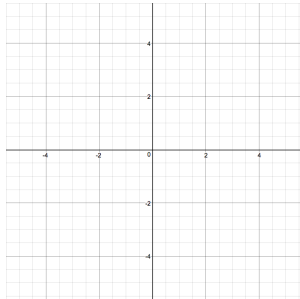
Name _____
 Date _____ **A#1**

Goal: To analyze the transformation of graphs

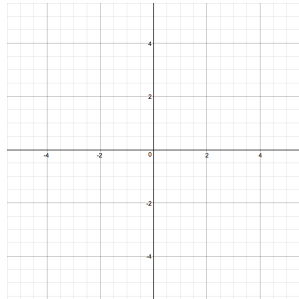
Warm Up: Graph each function below using your lovely calculator. Then sketch each in the coordinate planes.

Questions

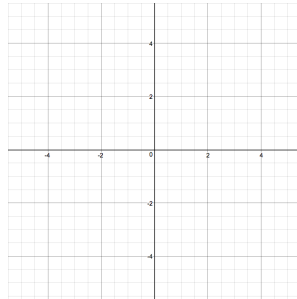
$f(x) = x$
 (linear)



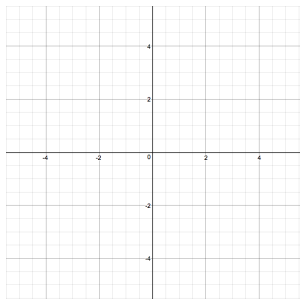
$f(x) = x^2$
 (quadratic)



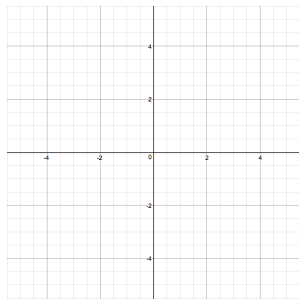
$f(x) = x^3$
 (cubic)



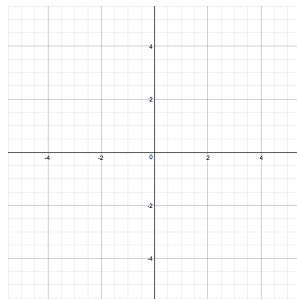
$f(x) = \sqrt{x}$
 (square root)



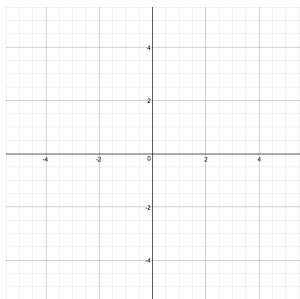
$f(x) = \frac{1}{x}$
 (inverse)



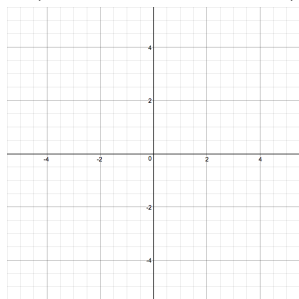
$f(x) = \frac{1}{x^2}$
 (inverse square)



$f(x) = |x|$
 (absolute value)



$f(x) = 2^x$
 (exponential growth)



Parent functions:

Questions

Exploration

1. Scan the QR code and explore the Desmos activity.
2. Answer the questions from Desmos below:



11.

42. h :

44. k :

46. a :

reflection

$af(x)$ where $a > 1$

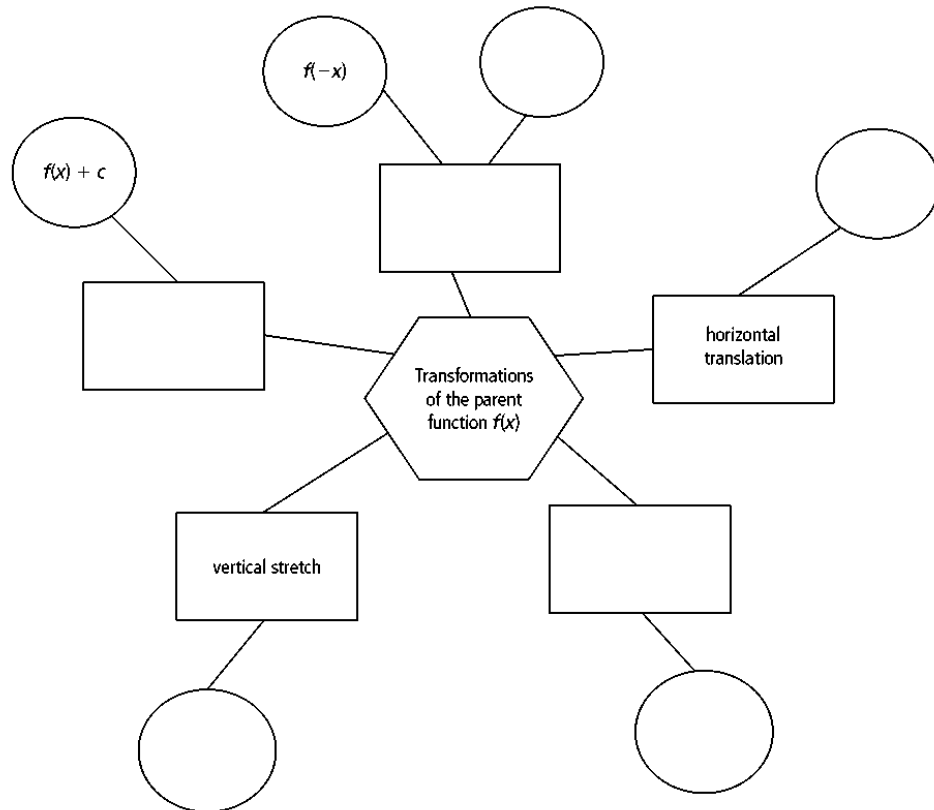
vertical translation

$f(x + h)$

$-f(x)$

vertical compression

$af(x)$ where $0 < a < 1$



Family of Functions

Questions

Given a parent function of $f(x)$, the following transformations are affected by the letters a , h , and k .

$$y = af(x - h) + k$$

Example 1: Identify the parent function and describe the transformation.

a. $y = 3x^2$

b. $y = x + 5$

c. $y = -\frac{1}{2}x^3$

d. $y = x - 2.5$

e. $y = -2f(x - 3) + 6$

f. $y = -4(x - 2)^2 - 10$

g. $y = (x + 5)^2$

h. $y = -2(x - 3)^3$

i. $y = \frac{1}{3}f(x + 2) - 4$

Questions

Example 2: Write an equation for each transformation of $f(x) = 6x - 2$.

- a vertical compression by a factor of $\frac{1}{3}$ and a reflection in the y -axis.
- a vertical stretch by a factor of 7 and a vertical translation up 5 units.
- a vertical stretch by a factor of 1.5 and a reflection in the y -axis

Example 3: Make a table of values for $f(x) = x$ after each given translation.

a. 8 units down

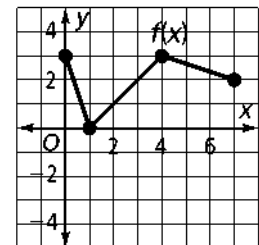
x	y	$y = x - 8$
-2	-2	
-1	-1	
0	0	
1	1	
2	2	

b. 4 units up

x	y	$y = x + 4$
-2	-2	
-1	-1	
0	0	
1	1	
2	2	

Example 4: The graph of the function $f(x)$ is shown at the right.

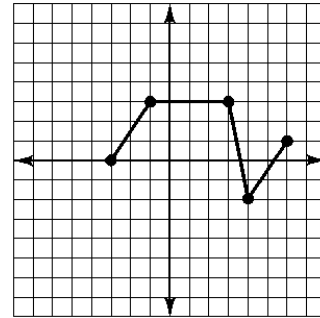
- Describe the transformation $f(x) - 2$.
- Graph $f(x)$ and $f(x) - 2$ on the same coordinate grid on the right



Transformations of a Graph

You can identify translations, reflections, vertical stretches, and compressions from a given algebraic equation. You can apply transformations to a graph even when it is not easy to write an equation for the graph.

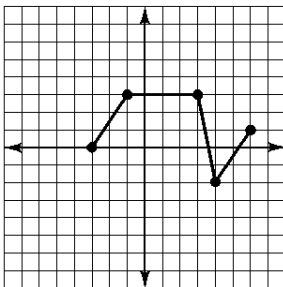
The graph at the right represents the function $y = f(x)$. Describe what effect each change to the equation will have on the graph of $f(x)$.



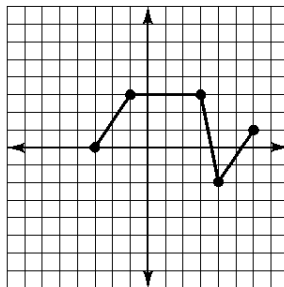
1. $y = 2f(x)$
2. $y = f(x) - 1$
3. $y = f(x + 4)$

Draw new graphs by applying each transformation. Apply the transformation to the endpoints and corner points first, and then connect the new points to form the new graph.

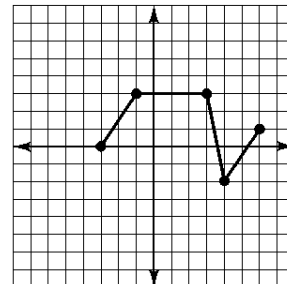
4. $y = 2f(x)$



5. $y = f(x) - 1$



6. $y = f(x + 4)$



Now make a new graph when all three transformations are applied together.

7. Graph $y = 2f(x + 4) - 1$.

