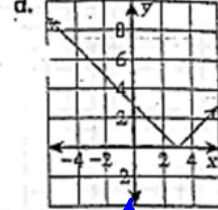
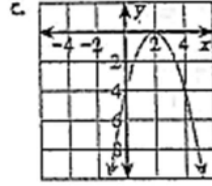
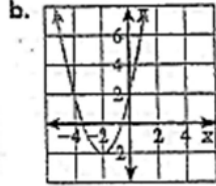
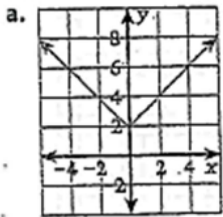


Function Transformations Part 2 Name: _____ Date: 2/28/17

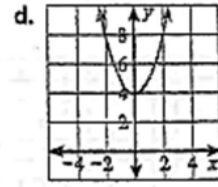
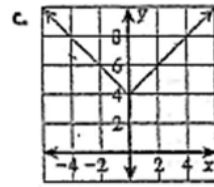
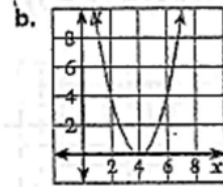
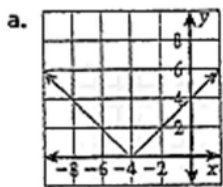
WARM UP

Match the function with its graph.

- 1) $f(x) = |x-3|$ ^D 2) $f(x) = |x|+2$ ^A 3) $f(x) = -(x-2)^2$ ^C 4) $f(x) = (x+2)^2-2$ ^B



- 5) $f(x) = (x-4)^2$ ^B 6) $f(x) = x^2+4$ ^D 7) $f(x) = |x|+4$ ^C 8) $f(x) = |x+4|$ ^A



Transformations (Functions)

"inside" \sqrt{x} $(x)^2$ $|x|$ subtract add "-" (negative sign)
 Right Left reflection
 ↔ y-axis

"Outside" \sqrt{x} $(x)^2$ $|x|$ add subtract "-" (neg. sign)
 up down X-axis
 ↑ reflection

Function Transformations Part 2 Name: _____ Date: _____

Function Transformations – Dilations

For each of the following, graph part (a) first then graph parts (b) and (c) in the same window.

Let $f(x) = x^2$ and $g(x) = \sqrt{x}$.

Graph	Formula	Observations
1. a) $y = f(x)$	$y = x^2$ (1, 1)	parabola
★ b) $y = 3f(x)$	$y = 3(x)^2$ (1, 3)	vertical stretch by 3
c) $y = (1/3)f(x)$	$y = (\frac{1}{3})(x)^2$ (1, $\frac{1}{3}$)	vertical compression by $\frac{1}{3}$
2. a) $y = g(x)$	$y = \sqrt{x}$	
b) $y = 3g(x)$	$y = 3\sqrt{x}$	vertical stretch by 3
c) $y = (1/3)g(x)$	$y = \frac{1}{3}\sqrt{x}$	vertical compression by $\frac{1}{3}$
1. a) $y = f(x)$	$y = x^2$	
★ b) $y = f(3x)$	$y = (3x)^2$	horizontal compression by 3
c) $y = f(1/3x)$	$y = (\frac{1}{3}x)^2$	horizontal stretch

$$-\left(\frac{1}{3}x\right)^2 + 5$$

Function Transformations Part 2 Name: _____ Date: _____

Let's summarize:

$a > 1$ (outside) vertical stretch by a
 $0 < a < 1$ (outside) vertical compression by a
 $a > 1$ (inside) horizontal compression by a
 $0 < a < 1$ (inside) horizontal stretch by a

For problems 3-7, given the parent function and a description of the transformation, write the equation of the transformed function, $f(x)$.

3. Linear - vertical stretch/compression by $\frac{2}{5}$, horizontal shift 9
 $y = x$ $y = \frac{2}{5}(x - 9)$

4. Quadratic - vertical stretch by 5, horizontal shift left 8
 $y = x^2$ $y = 5(x + 8)^2$

5. Exponential - vertical shift by 7, horizontal shift 11
 $y = 2^x$ $y = 2^{(x-11)} + 7$

6. Quadratic - vertical stretch/compression +7, vertical shift down 2
 $y = x^2$ $y = 7(x)^2 - 2$
 $y = 7x^2 - 2$

7. Radical - shift down 4, right 2, vertical stretch by 3
 $y = \sqrt{x}$ $y = 3\sqrt{x-2} - 4$



Function Transformations Part 2 Name: _____ Date: _____

State the parent function and the transformation(s)

$$y = 4(x)^2 - 1$$

1.	$f(x) = 4x^2 - 1$	Quad. $y = x^2$	vertical stretch by 4 down 1
2.	$f(x) = 3(x - 1)^3 + 7$	cubic $y = x^3$	right 1 vertical stretch by 3 up 7
3.	$f(x) = 2(x + 4)^2 + 2$		
4.	$f(x) = \frac{x^2}{5} + 3$ $\frac{1}{5}x^2 + 3$	$y = x^2$ Quad	vertical compress $\frac{1}{5}$ up 3
5.	$f(x) = \frac{\sqrt{x}}{3} + 2$ $\frac{1}{3}\sqrt{x} + 2$	Square root $y = \sqrt{x}$	vert. comp by $\frac{1}{3}$ up 2

2x

∴ $\sin(x)$ 
 $\cos(x)$ 

Function Transformations Part 2 Practice name: _____ date: _____

Exercises

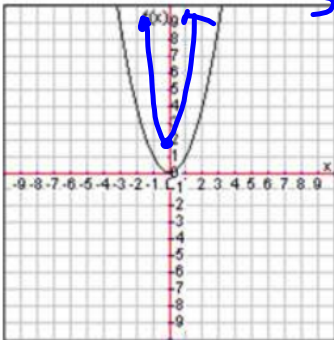
For #1-10, suppose that $f(x) = x^8$. Match each of the numbered functions on the left with the lettered function on the right that it equals.

- | | | |
|-----------------------|---|-----------------------|
| 1.) $f(x) + 2$ | D | A.) $(-x)^8$ |
| 2.) $3f(x)$ | | B.) $\frac{1}{3}x^8$ |
| 3.) $f(-x)$ | | C.) $x^8 - 2$ |
| 4.) $f(x - 2)$ | | D.) $x^8 + 2$ |
| 5.) $\frac{1}{3}f(x)$ | | E.) $(\frac{x}{3})^8$ |
| 6.) $f(3x)$ | | F.) $-x^8$ |
| 7.) $f(x) - 2$ | | G.) $(x - 2)^8$ |
| 8.) $-f(x)$ | | H.) $(3x)^8$ |
| 9.) $f(x + 2)$ | | I.) $3x^8$ |
| 10.) $f(\frac{x}{3})$ | | J.) $(x + 2)^8$ |

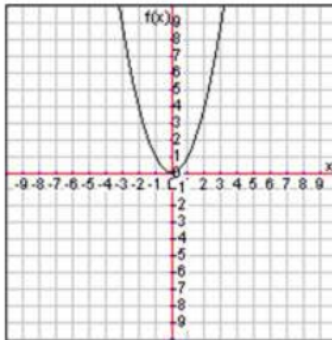
Function Transformations Part 2 Practice name: _____ date: _____

Describe the transformation applied to the parent function $f(x) = x^2$. Then do a quick sketch of each one.

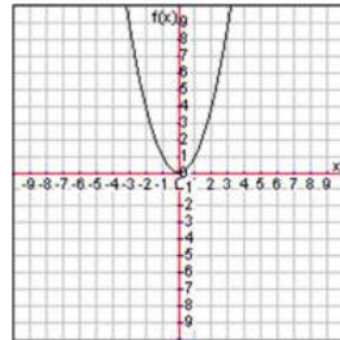
1. $f(3x) + 2$
Handwritten: up 2, H compress 3



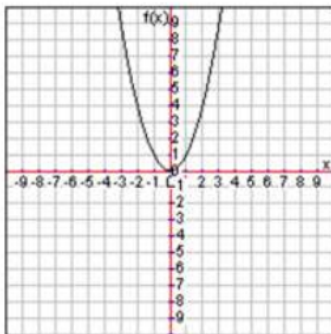
2. $\frac{1}{2} * f(x - 2)$



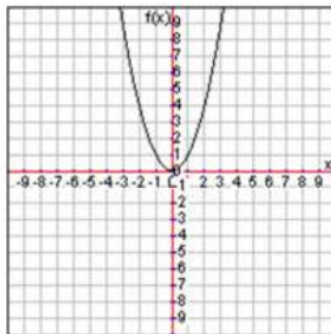
3. $-f(x + 5)$



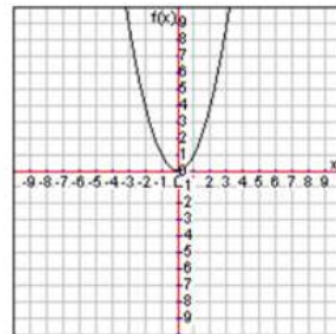
4. $g(x) = (x - 1)^2$



5. $g(x) = 2x^2 - 8$

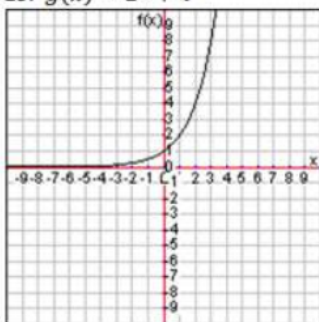


6. $g(x) = -(x + 6)^2$

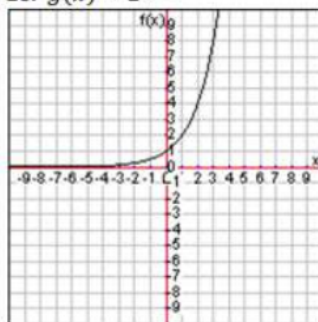


Describe the transform denoted by $g(x)$ using the function $f(x) = 2^x$ as the parent function. Write $g(x)$ in terms of $f(x)$ and then do a quick sketch of the graph of $g(x)$. The function $f(x)$ is already graphed for you.

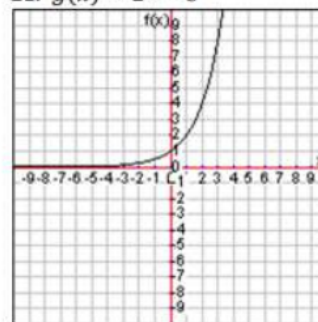
19. $g(x) = 2^x + 4$



20. $g(x) = 2^{x+4}$

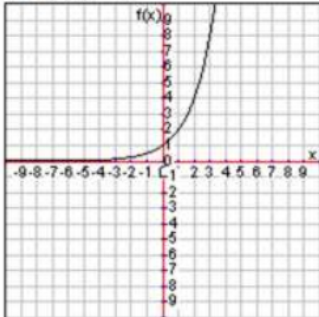


21. $g(x) = 2^x - 3$

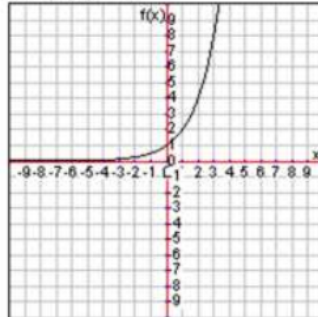


Function Transformations Part 2 Practice name: _____ date: _____

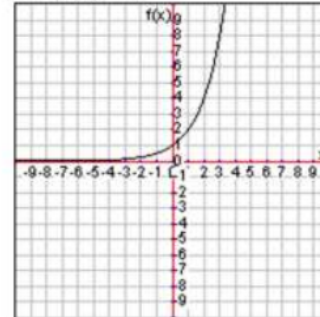
22. $g(x) = 2^{0.5x}$



23. $g(x) = 2^{2x}$

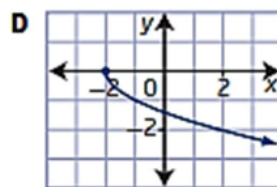
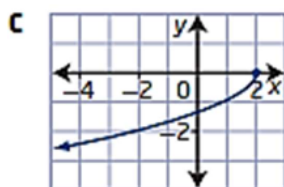
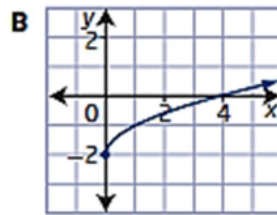
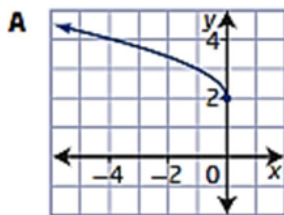


24. $g(x) = 2^{-2x}$



3. Match each function with its graph.

- a) $y = \sqrt{x} - 2$
- b) $y = \sqrt{-x} + 2$
- c) $y = -\sqrt{x+2}$
- d) $y = -\sqrt{-(x-2)}$



Function Transformations Part 2 Practice name: _____ date: _____

2. Explain how to transform the graph of $y = \sqrt{x}$ to obtain the graph of each function. State the domain and range in each case.

a) $y = 7\sqrt{x-9}$

b) $y = \sqrt{-x} + 8$

c) $y = -\sqrt{0.2x}$

d) $4 + y = \frac{1}{3}\sqrt{x+6}$

Describe the transformations to the parent function $y = |x|$ to create the following functions.

1. $y = |x-2|$

Transformation:

2. $y = |x|+3$

Transformation:

3. $y = 2|x+3|$

Transformation:

4. $y = 3|x|$

Transformation:

5. $y = -2|x+3|-1$

Transformation:

6. $y = 2|x+8|$

Transformation: