Warm -up

Identify the following:

Thursday, January 29, 2015

Intervals

Increasing: $(-2, 1)$

Decreasing: $(-\infty, -2), (1, \infty)$

Constant: *None*

X Intercepts: $(-3, 0), (0, 0), (2, 0)$

Y Intercepts: $(0, 0)$

Relative Maximum(s): $(1, 4)$

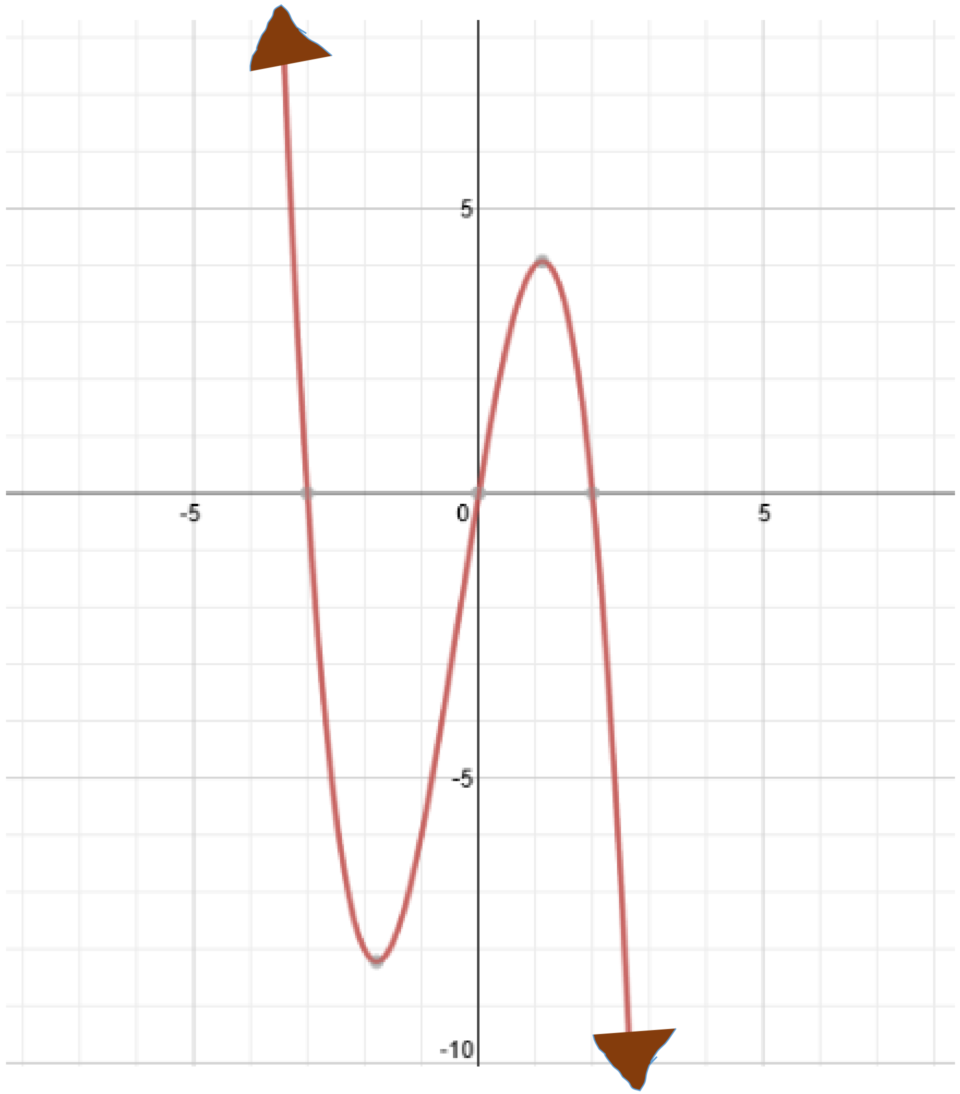
Relative Minimum(s): $(-1, -8)$

Domain: ***All Real Numbers***

Range: ***All Real Numbers***

End Behavior: $as\ x \to \infty, y \to -\infty$

$as\ x \to -\infty, y \to \infty$



Objectives for today

Identify vertical, horizontal and flip transformations from both a function equation and a function graph.

Transformations

Vertical Transformations

Function Notation	Description of Transformation
$g(x) = f(x) \pm c$	Vertical shift **up** C units if C is **positive**
	Vertical shift **down** C units if C is **negative**

Horizontal Translations

Function Notation	Description of Transformation
$g(x) = f(x \pm c)$	Horizontal shift **left** C units if C is **positive**.
	Horizontal shift **right** C units if C is negative

Flips

Function Notation	Description of Transformation
$g(x) = -f(x)$	Reflected over the x-axis

Transformations

	Parent Function	Transformations
$y = \lvert x \rvert + 1$	Absolute Value	Up 1
$y = \lvert x + 2 \rvert$	Absolute Value	Left 2
$y = \sqrt{x - 7}$	Radical – Square Root	Right 7
$y = x^3 - 6$	Cubic	Down 6
$y = -(x - 8)^2 - 6$	Quadratic	Flip, Right 8, Down 6
$y = \sqrt{x + 5} + 42$	Radical	Left 5, Up 42

What’s the difference?

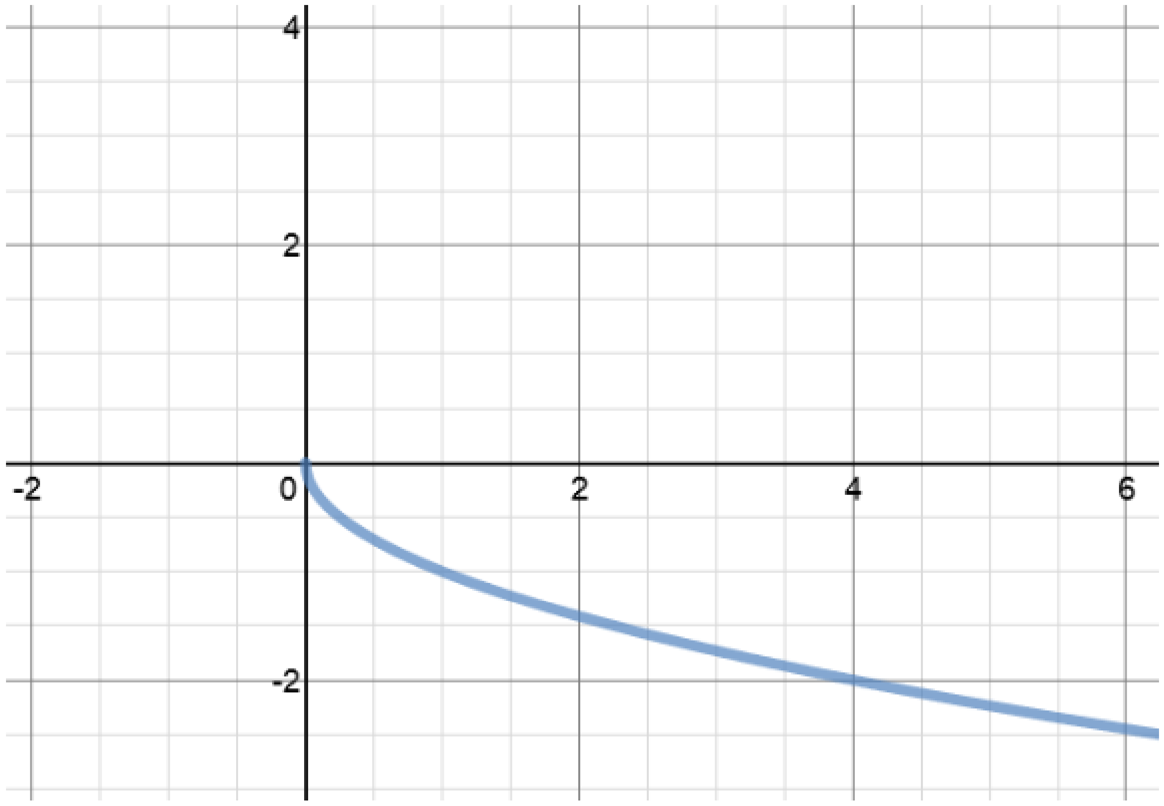
$$y = -x^2$$
$$y = (-x)^2$$

ORDER OF OPERATIONS		
P	Please	Parentheses
E	Excuse	Exponents
M	My	Multiplication
D	Dear	Division
A	Aunt	Addition
S	Sally	Subtraction

Transformations

Write the equation for the transformed function represented in this graph.

$f(x) = -\sqrt{x}$



Parent Function? **Radical, $f(x) = \sqrt{x}$**

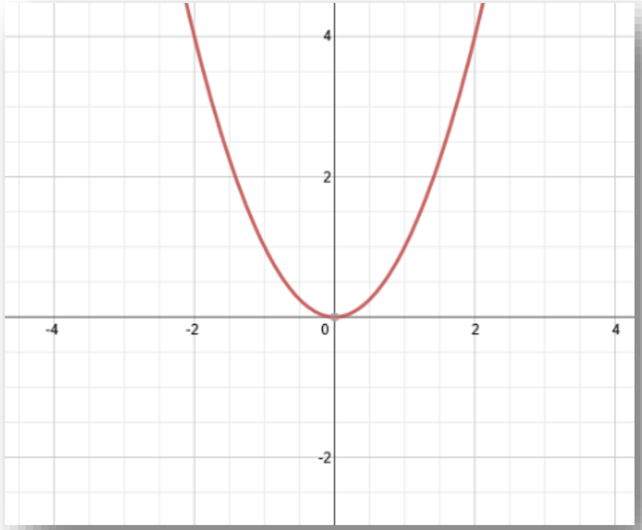
What do we know about the shape of the graph that can help us? **Starts at (0,0) and <u>increases</u>**

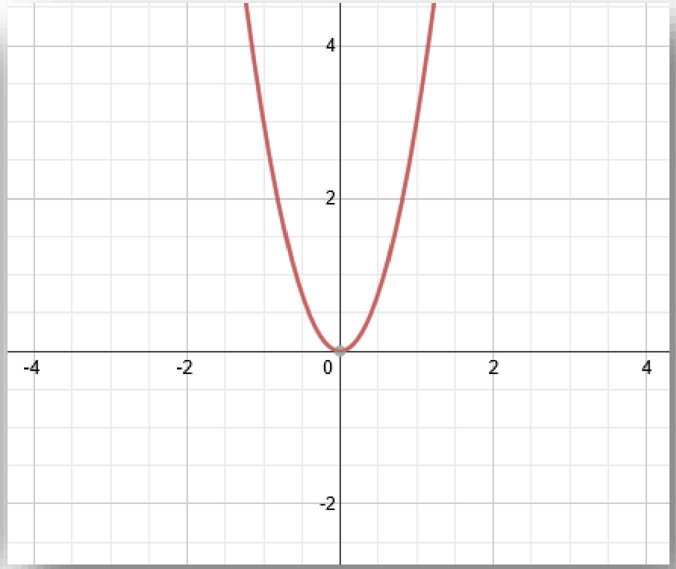
How is it different? **Starts at (0,0) and <u>decreases.</u>**

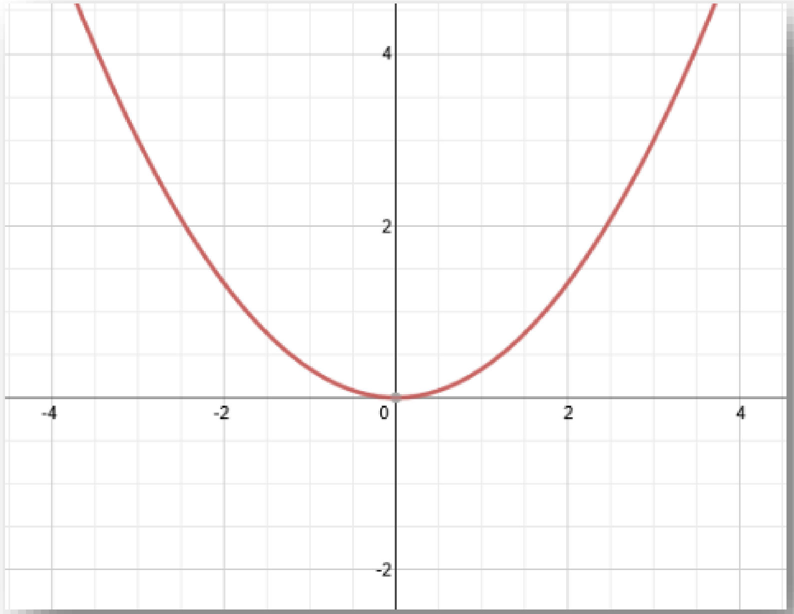
Which axis has it flipped over? **X-axis**

Transformations

Stretching and Compressing a function.







Parent Function

Quadratic
$f(x)=x^2$

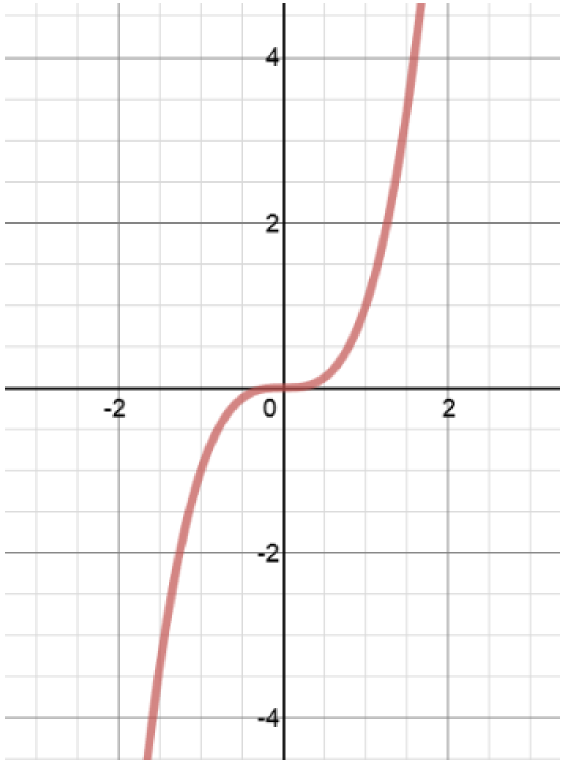
Transformed Function

Vertical stretch

Transformed Function

Vertical compression

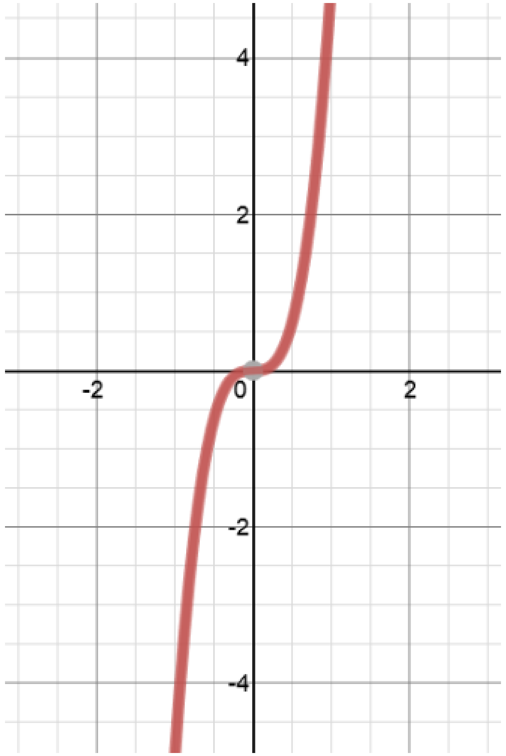
Stretching and Compressing a function.



Parent Function

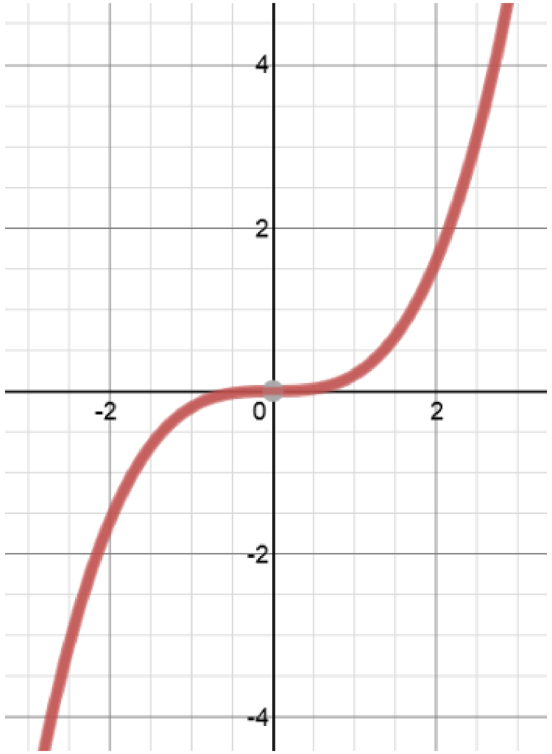
Quadratic

$f(x)=x^3$



Transformed Function

Vertical stretch



Transformed Function

Vertical compression

So how do we represent these transformations algebraically?

Vertical Stretches and Compressions

When functions are multiplied by a constant **outside** of the f(x) part, you stretch and compress the function.

Function Notation	Description of Transformation
$f(x) = cf(x)$	Vertical **Stretch** if $\boldsymbol{c > 1}$
	Vertical **Compression** if $\boldsymbol{0 < c < 1}$

Vertical Stretches and Compressions

Function Notation	Description of Transformation
$f(x) = cf(x)$	Vertical **Stretch** if $\boldsymbol{c > 1}$
	Vertical **Compression** if $\boldsymbol{0 < c < 1}$

How do we interpret this function notation?

Let $f(x) = x^2$ and $c = 3$ then $g(x) = 3x^3$

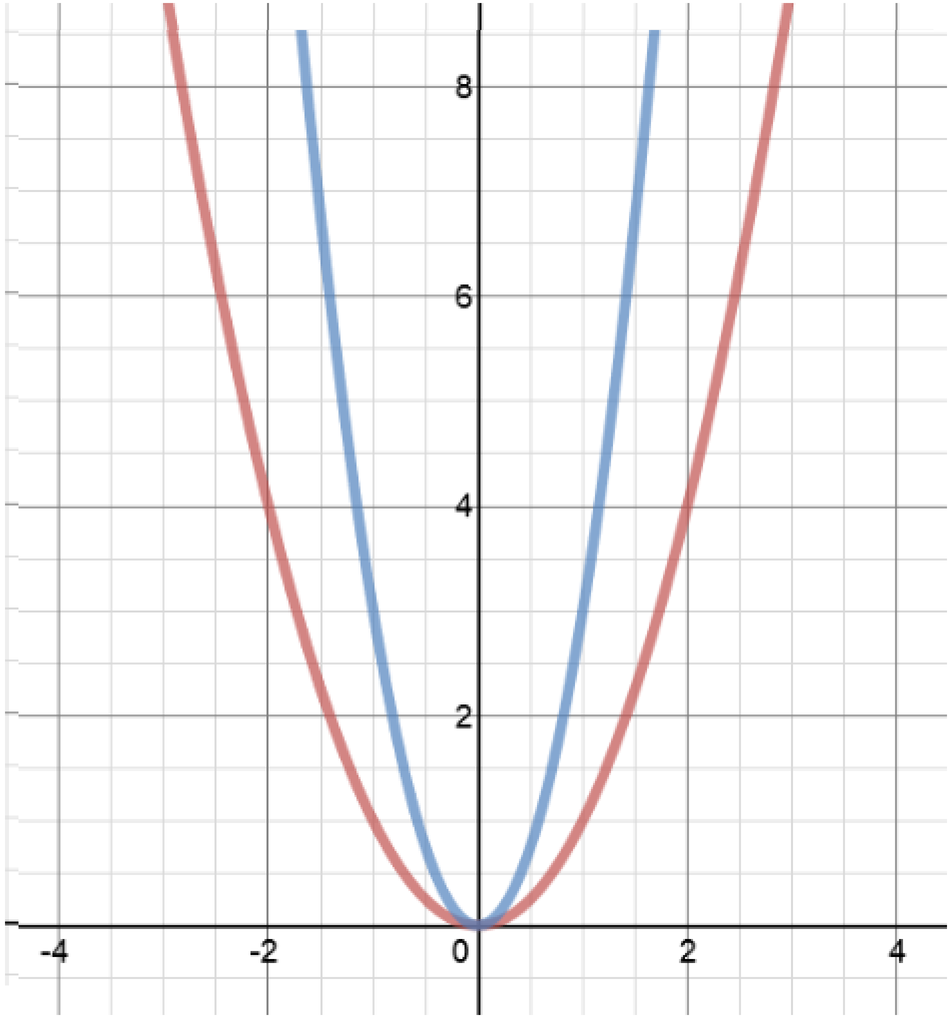
Let $f(x) = \sqrt{x}$ and $c = \frac{1}{4}$ then $g(x) = \frac{1}{4}\sqrt{x}$

Let $f(x) = 2^x$ and $c = 7$ then $g(x) = 7(2^x)$

Let's play **"What's going to happen to the parent function?"**

$$f(x) = 3x^2$$

X	X^2	$3X^2$
3	9	27
2	4	12
1	1	3
0	0	0
-1	1	3
-2	4	12
-3	9	27

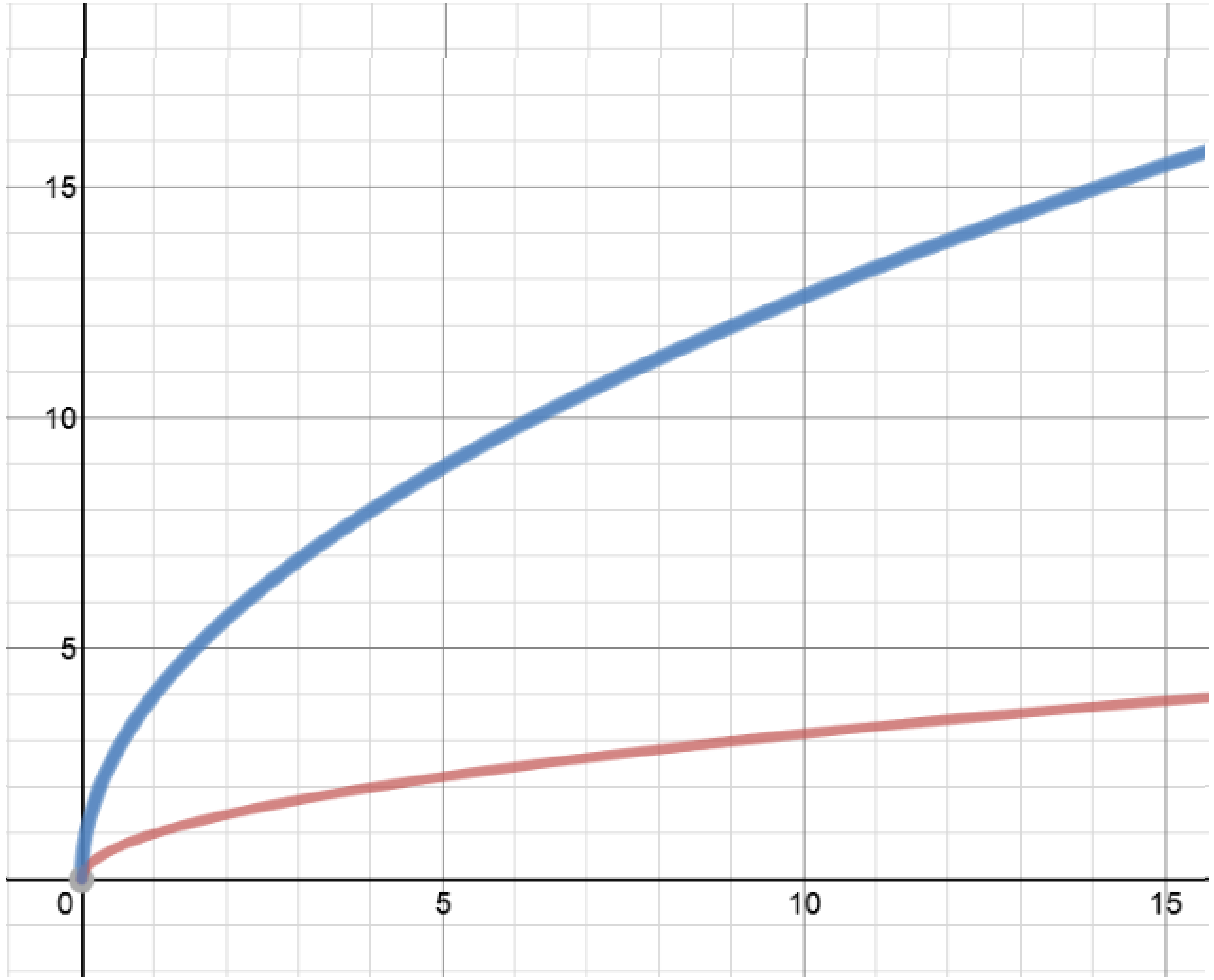


Transformations

Let's play **"What's going to happen to the parent function?"**

$$f(x) = 4\sqrt{x}$$

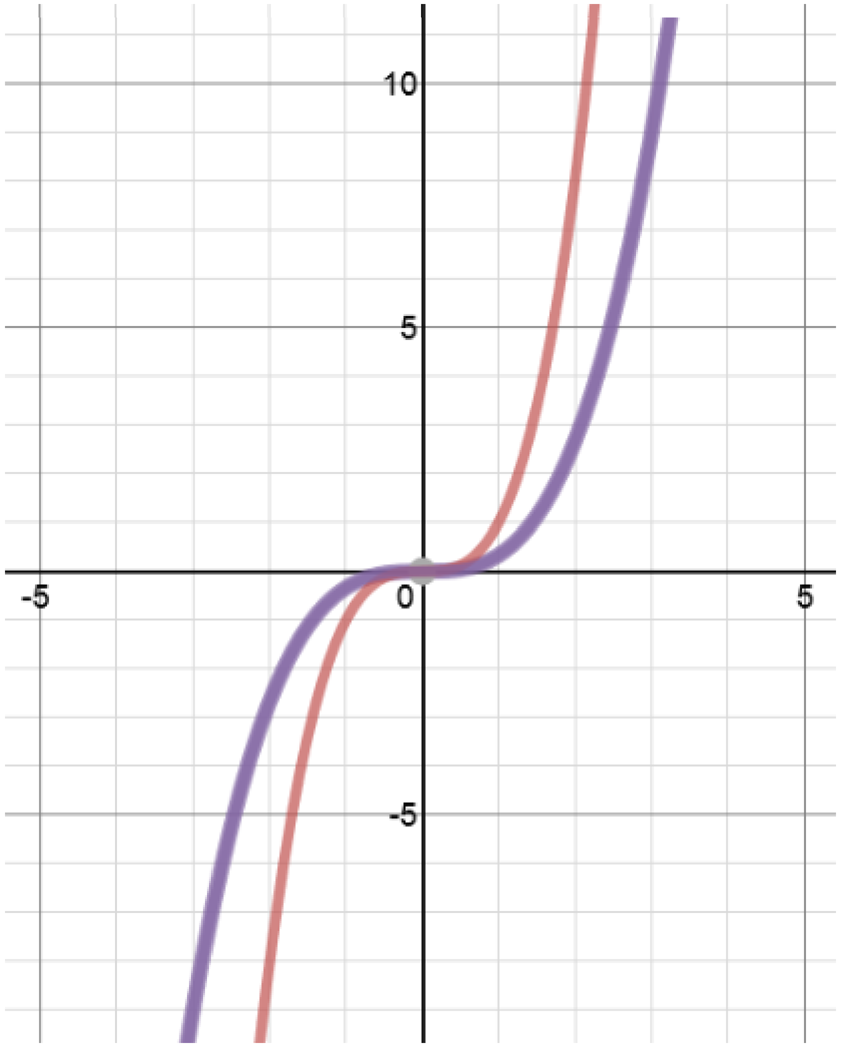
X	$\sqrt{x}$	$4\sqrt{x}$
9	3	12
4	2	8
1	1	4
0	0	0



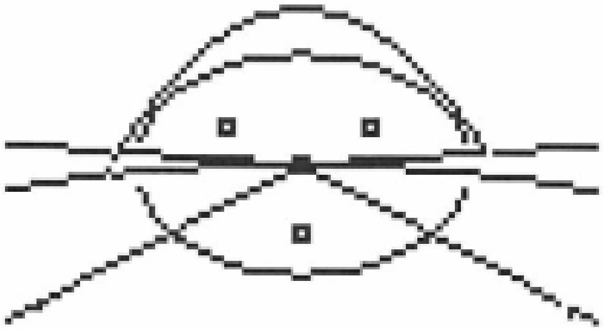
Transformations

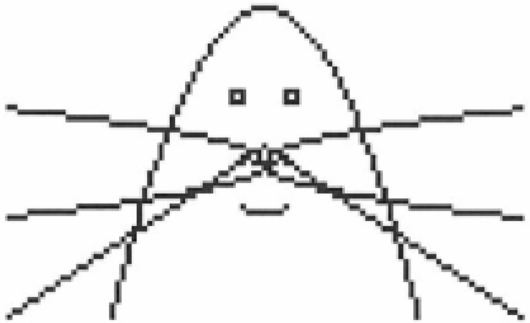
Let's play **"What's going to happen to the parent function?"**

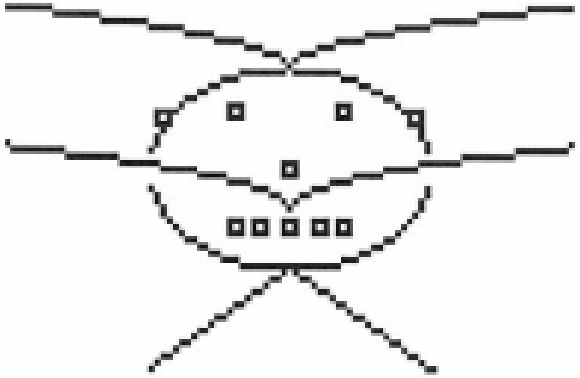
$$f(x) = \frac{1}{3}x^3$$

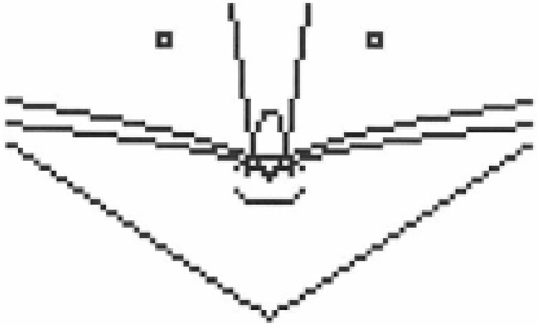


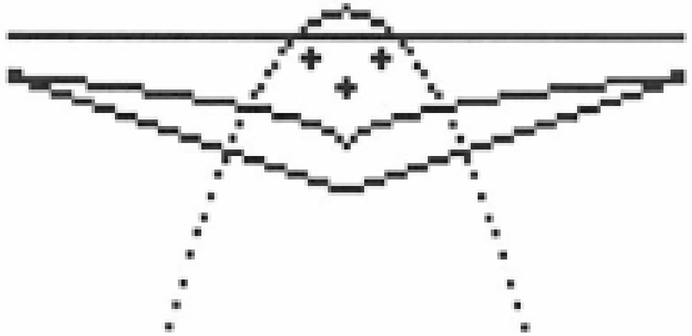
I spy functions!

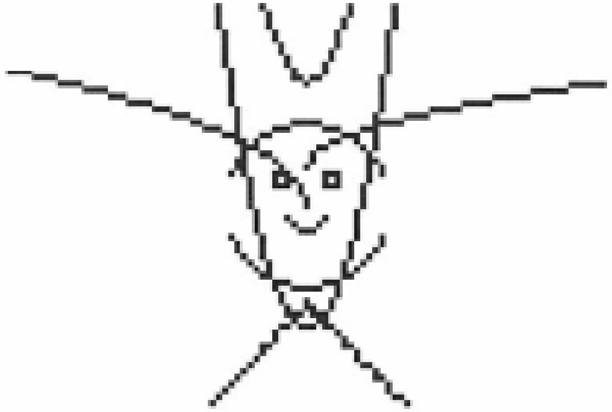




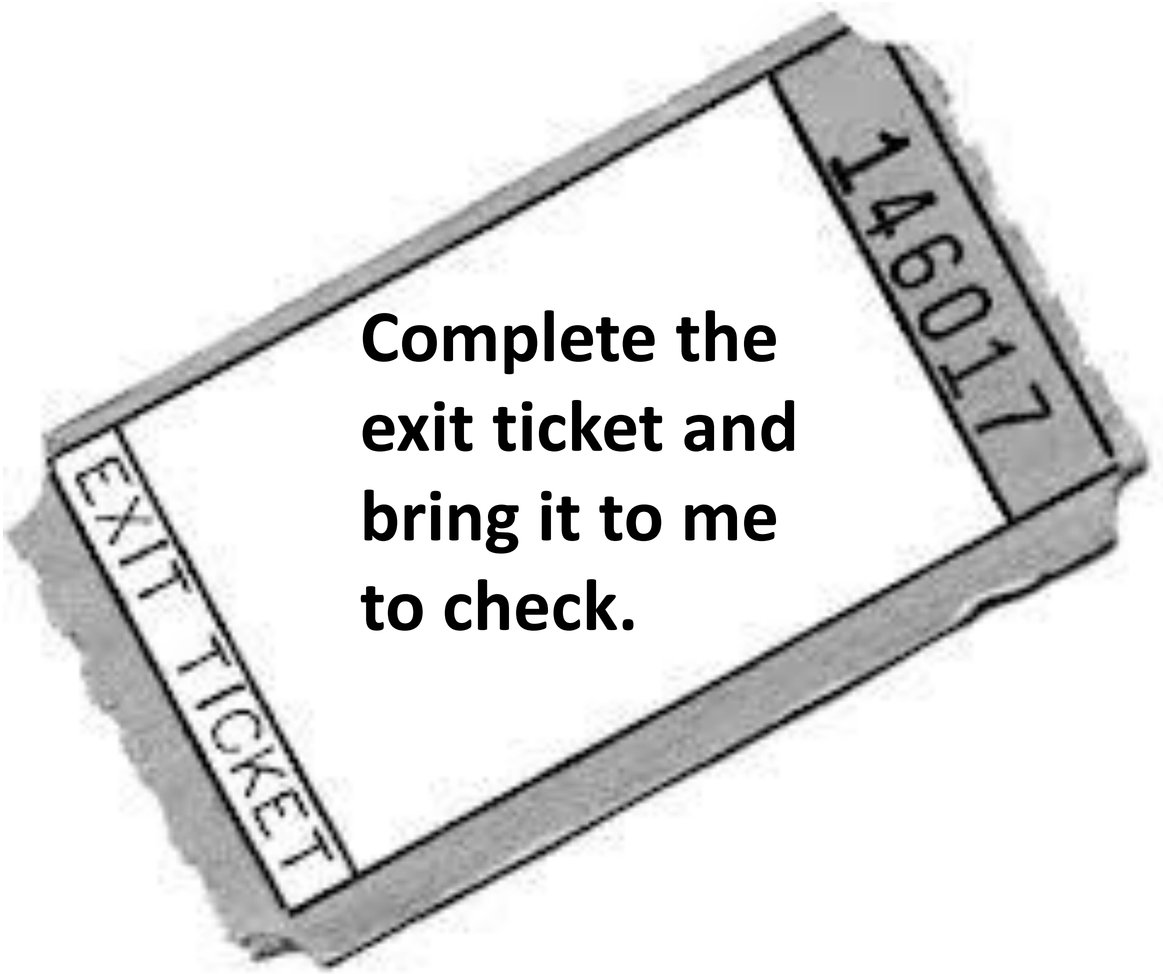








Did we meet our objectives?



Complete the exit ticket and bring it to me to check.