Warm -up

Sunday, February 1, 2015

For the following equations, identify the parent function and any transformations.

1. $f(x) = x^3 + 3$ **Cubic, U3**

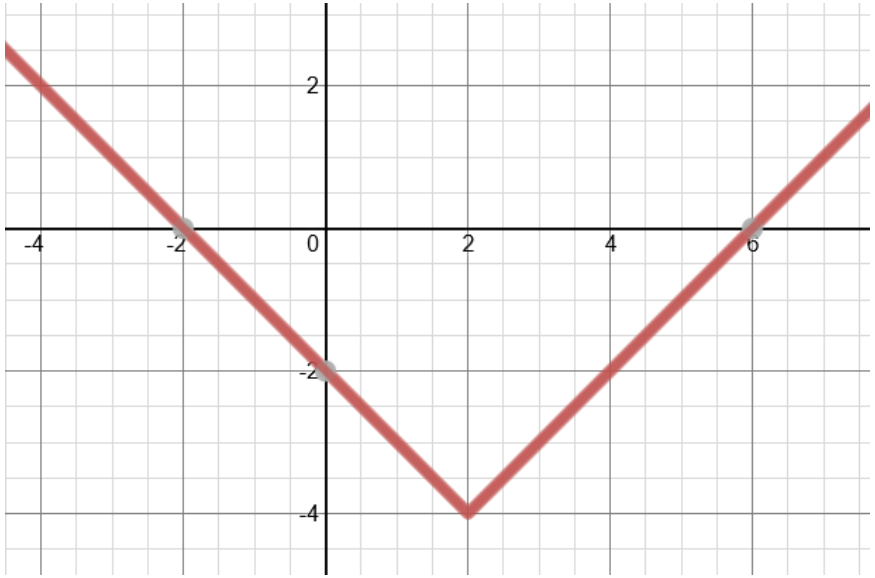
2. $f(x) = \sqrt{x - 2}$ **Radical, R2**

3. $f(x) = |x + 3| - 7$ **Absolute Value, L3 D7**

4. $f(x) = (x - 2)^2 + 8$ **Quadratic, R2 U8**

5. Write the equation of the function pictured in the graph to the right.

$$f(x) = |x - 2| - 4$$



Objectives for today

Identify Compression and Stretch transformations from a function equation.

Write a function equation from a description of transformations.

Apply transformations to functions that have already been transformed.

Determine the transformations that change one function to another function.

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

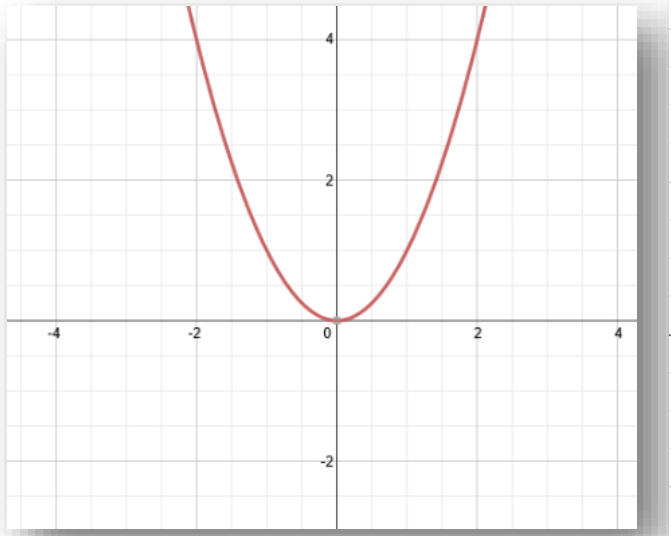
Function Notation	Description of Transformation
$g(x) = f(x \pm c)$	Horizontal shift **left** C units if C is **positive**.
	Horizontal shift **right** C units if C is negative

Flips

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

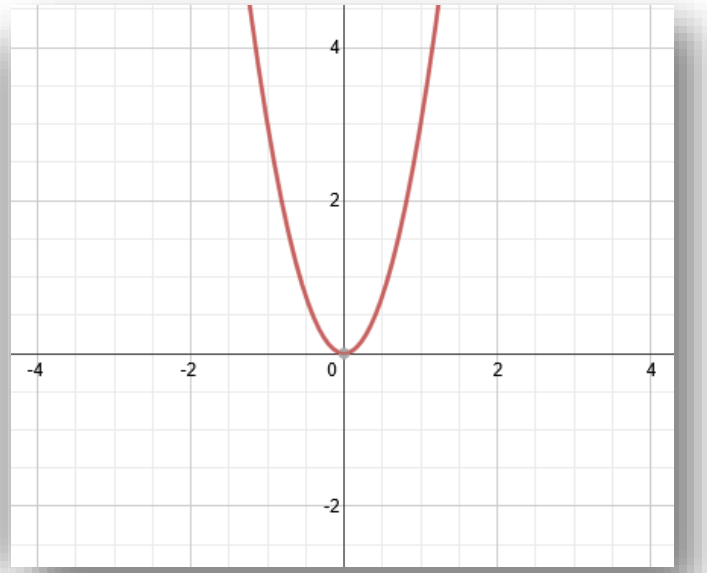
Transformations

Stretching and Compressing a function.



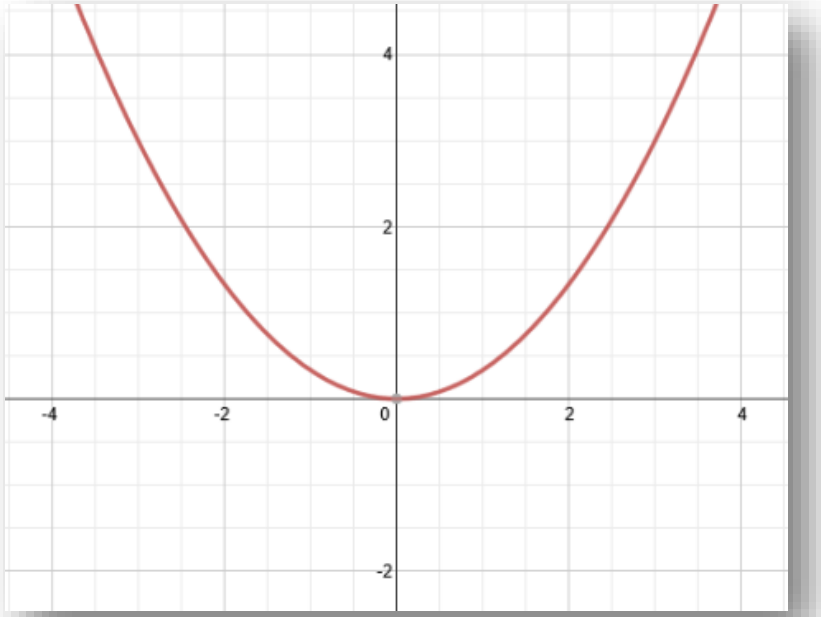
Parent Function

Quadratic
$f(x)=x^2$



Transformed Function

Vertical stretch

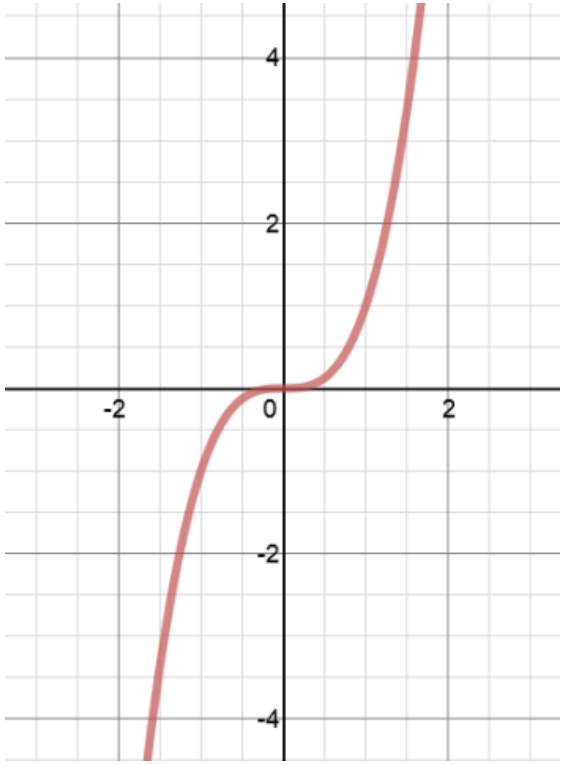


Transformed Function

Vertical compression

Transformations

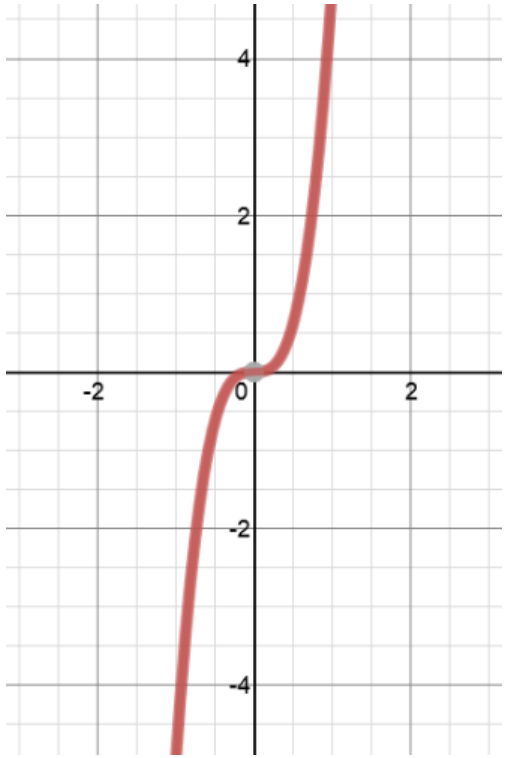
Stretching and Compressing a function.



Parent Function

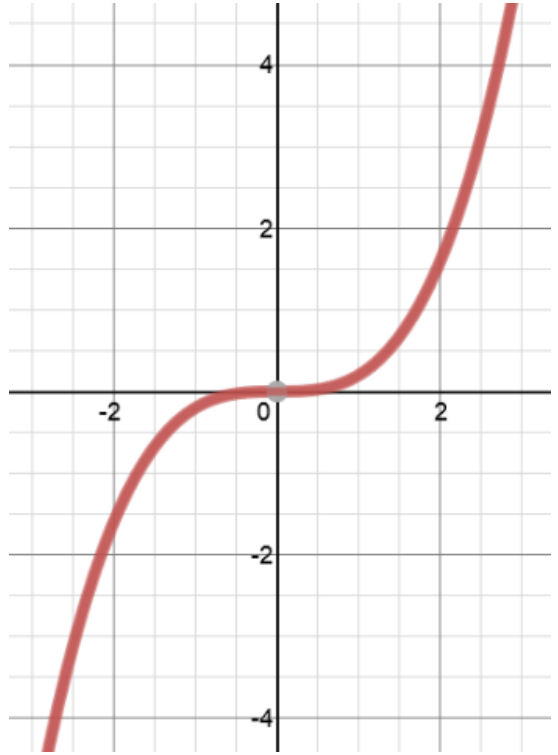
Quadratic

$f(x)=x^3$



Transformed Function

Vertical stretch



Transformed Function

Vertical compression

So how do we represent these transformations algebraically?

Transformations

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 $\boldsymbol{0 < c < 1}$

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 $g(x) = \frac{1}{4}\sqrt{x}$

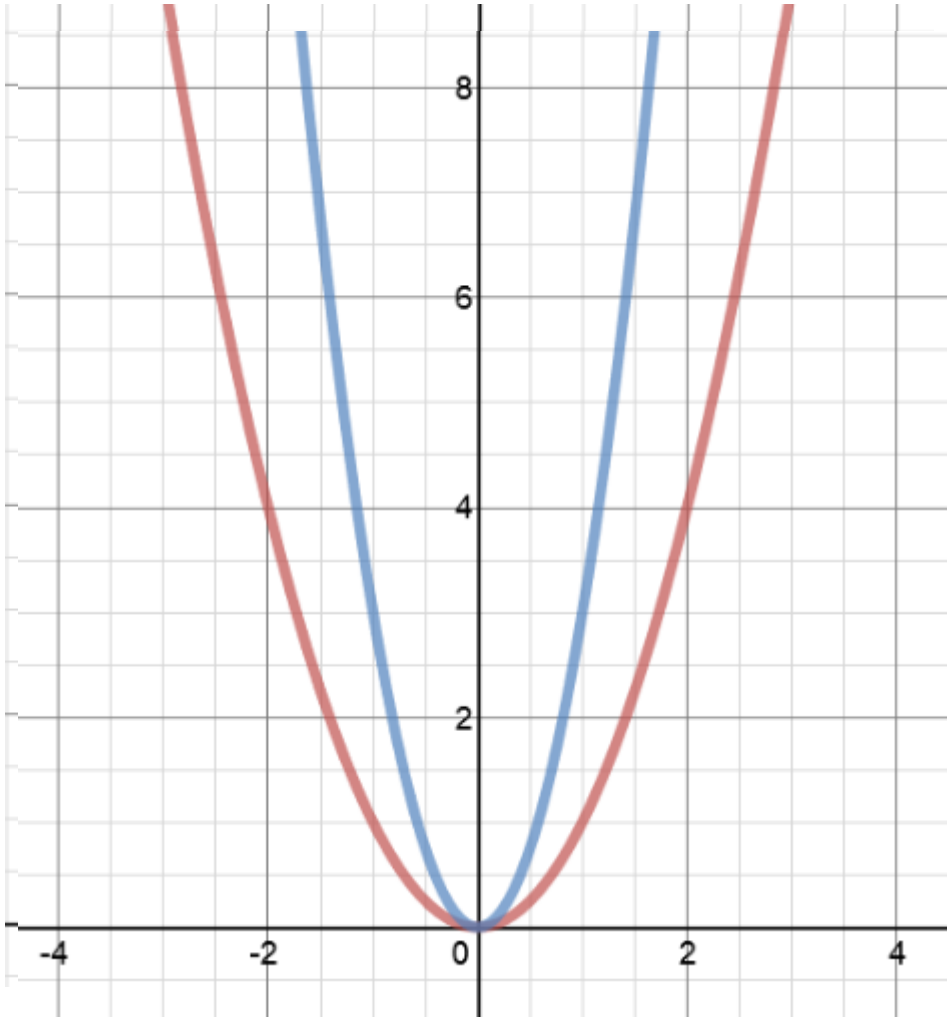
Let $f(x) = |x|$ and $c = 7$ then $g(x) = 7|x|$

Transformations

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



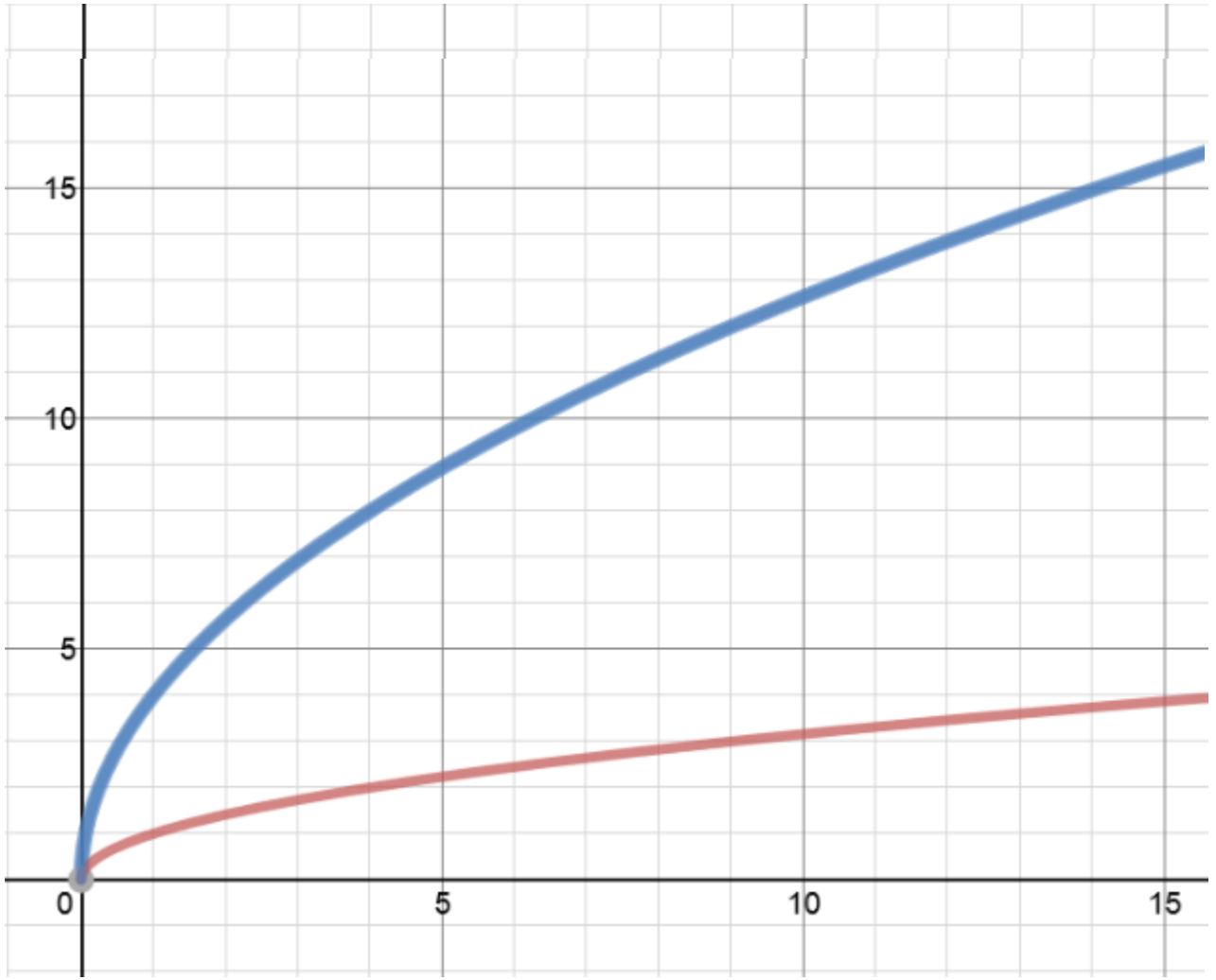
We say $f(x)$ has been stretched by a factor of 3.

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



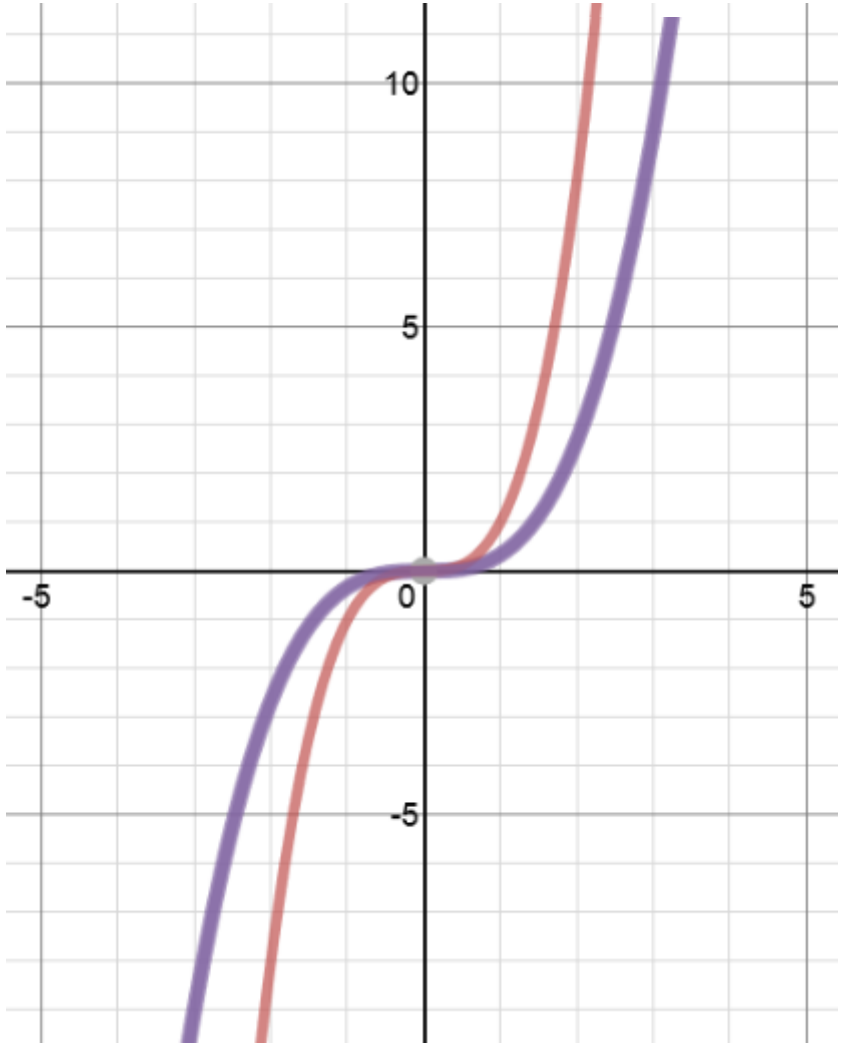
We say $f(x)$ has been stretched by a factor of 4.

Transformations

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

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

We say $f(x)$ has been compressed by a factor of $\frac{1}{3}$.



Transformations

	Parent Function	Transformations
$y = 3\|x\| + 1$	Absolute Value	Stretch factor 3, Up 1
$y = \frac{1}{2}\|x + 7\|$	Absolute Value	Compression factor $\frac{1}{2}$ Left 7
$y = -5\sqrt{x - 7}$	Radical – Square Root	Flip, Stretch factor 5 Right 7
$y = -x^3 - 6$	Cubic	Flip, Down 6
$y = 2(x - 8)^2 - 6$	Quadratic	Stretch factor 2, Right 8, Down 6
$y = 0.5\sqrt{x + 5} + 42$	Radical	Compression Factor 0.5 Left 5, Up 42

Transformations

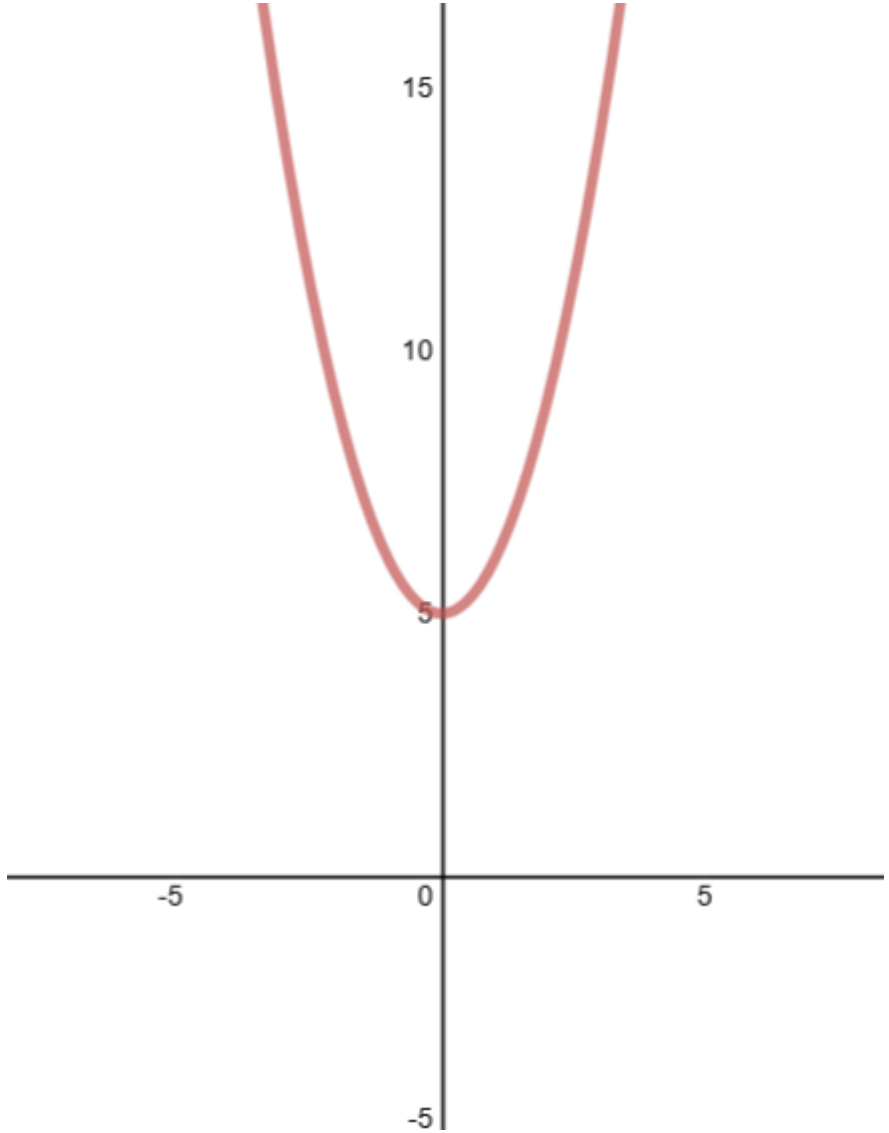
Shifts of Shifts

This is when we take a function that has already had transformations applied to it and then move it around even more!

For example, let's start with the function $f(x) = x^2 + 5$. What if we want to move it 6 units down?

What would be the equation of that graph?

Where is the new vertex?



Transformations

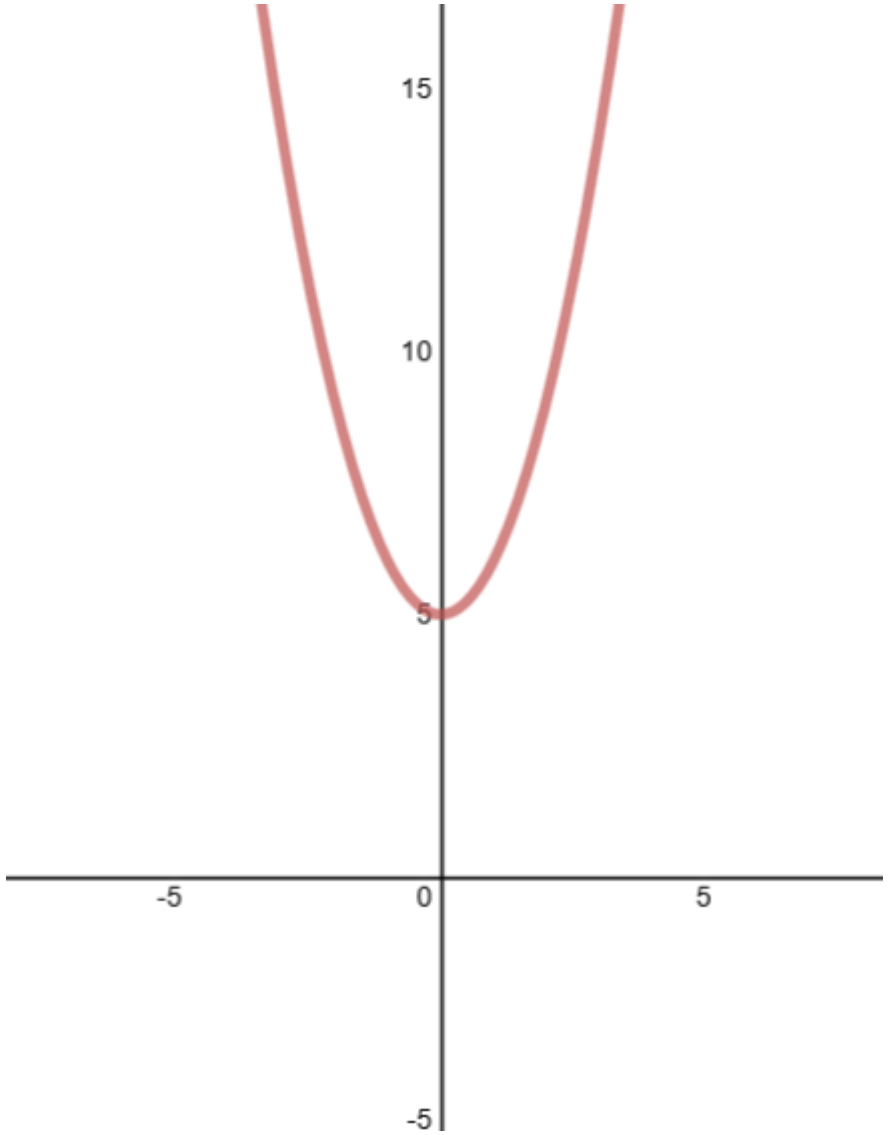
Shifts of Shifts

$f(x) = x^2 + 5.$

What if we want to move it 3 units left?

Where is the new vertex?

What would be the equation of that graph?



Transformations

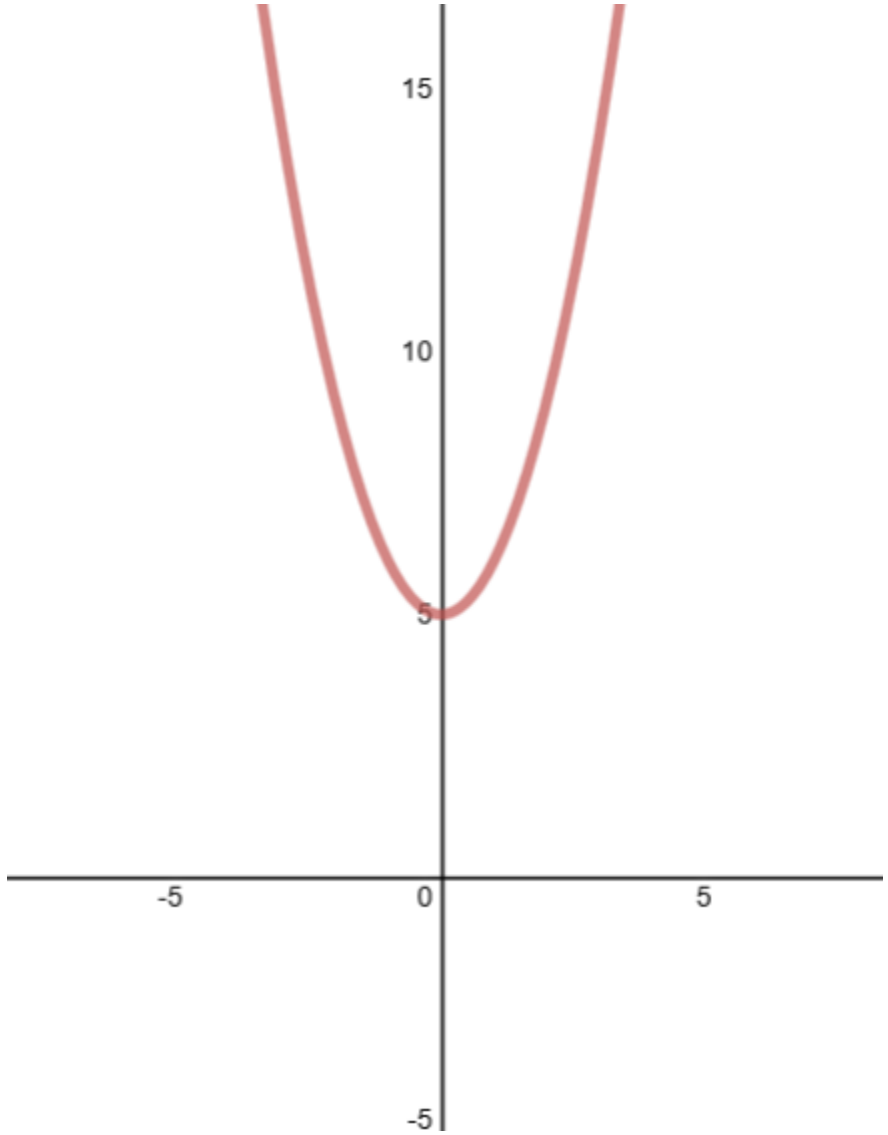
Shifts of Shifts

$f(x) = x^2 + 5.$

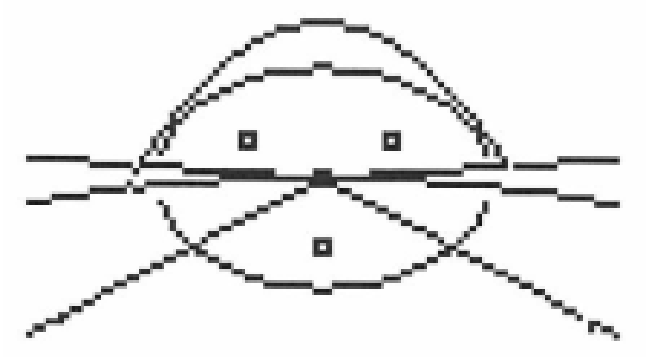
What if we want to move it 1 unit right and one unit up?

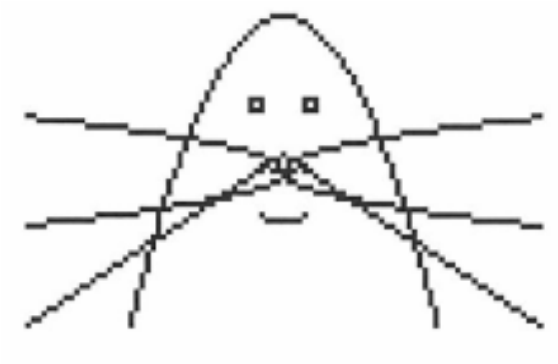
Where is the new vertex?

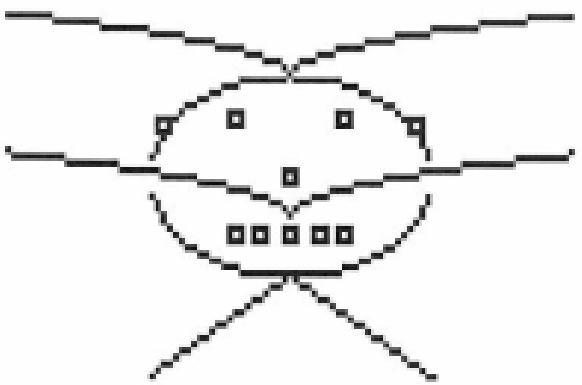
What would be the equation of that graph?

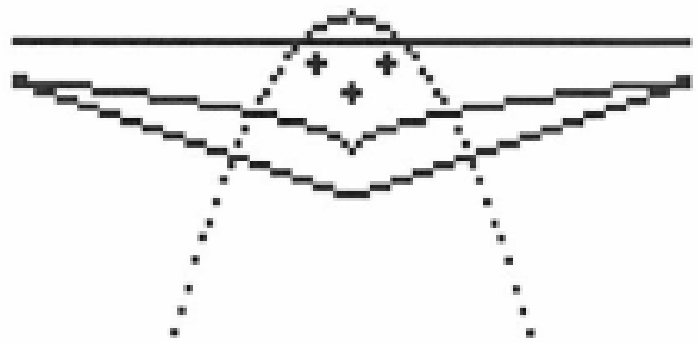


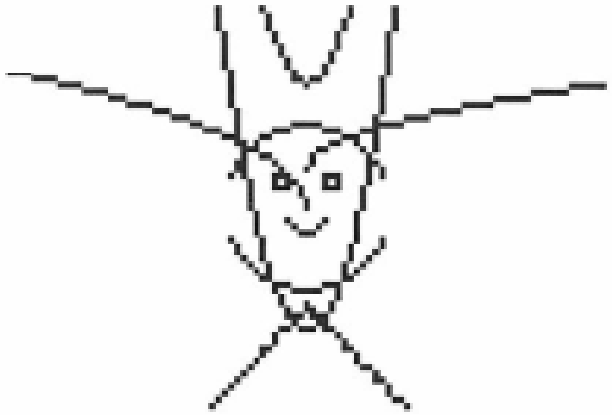
I spy functions!











Did we meet our objectives?