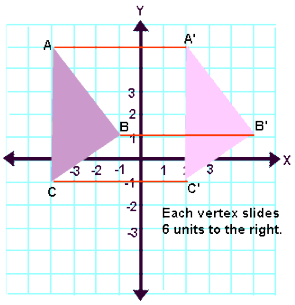
Essential Questions: What are transformations? How do we transform functions?

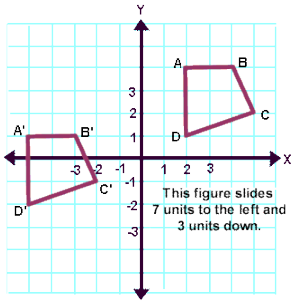
Transformations

- **a mathematical process that changes the size or position of a geometric figure. Transforming a function means to apply a change to a parent function to produce another function with similar characteristics.**

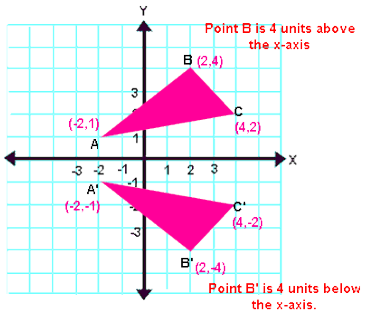
Rigid Transformations (describes changes in location but not size and shape.)

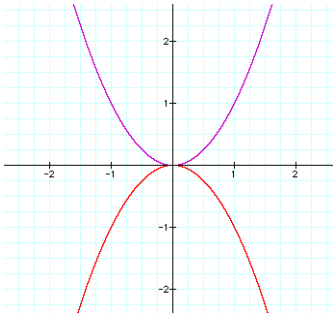
- **TRANSLATION: a transformation in which a geometric figure or function slides to another position.**





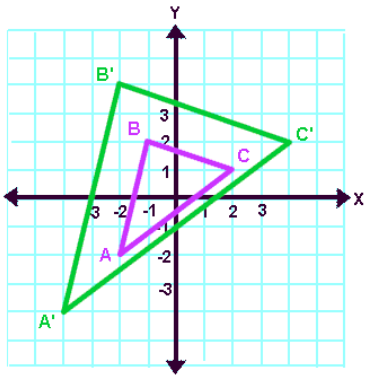
- **REFLECTION: a transformation in which a geometric figure or function is flipped over a line of reflection.**

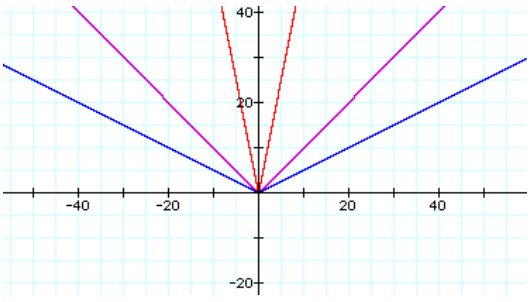




Non-Rigid Transformations (describes changes in size but not shape.)

- **DILATION: a transformation in which a figure or function is either enlarged/stretched or shrunk/compressed.**





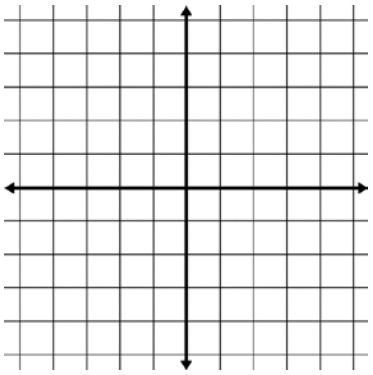
PART I [Set the WINDOW setting of your calculator to Zstandard (zoom #6)]
Graph each parent function, $f(x)$. Use a graphing calculator to graph the two new functions $y = f(x) + k$ for k = -4, and 3 in the same coordinate system.

Note: You should have 3 graphs in each window. Sketch a copy of your screen.

(a) $f(x) = x$

1) $a(x) = x - 4$

2) $b(x) = x + 3$



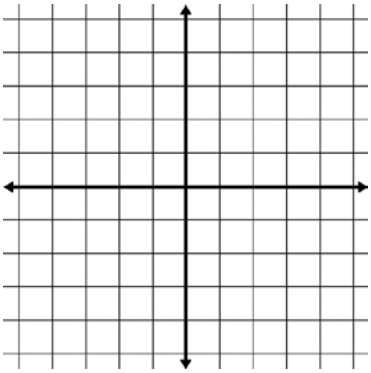
Write your prediction of what change you think will happen in part b.

Then graph part b and see if your prediction was correct.

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

1) $c(x) = \sqrt{x} - 4$

2) $d(x) = \sqrt{x} + 3$



What happened when you subtracted 4 from outside the parent function?

What happened when you added 3 outside the parent function?

Function Notation	Type of transformation
$f(x) + k$	
$f(x) - k$	

PART II

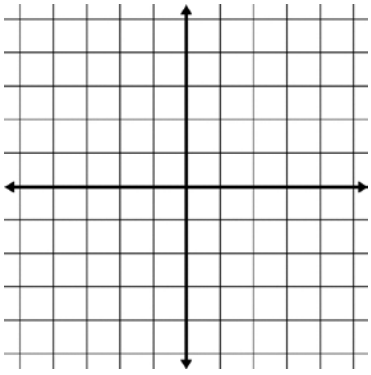
Graph each parent function, $f(x)$, and use a graphing calculator to graph $y = f(x + h)$ for h = -4, and 3 in the same coordinate system.

Note: You should have 3 graphs in each window. Sketch a copy of your screen.

(a) $f(x) = |x|$

1) $a(x) = |x - 4|$

2) $b(x) = |x + 3|$



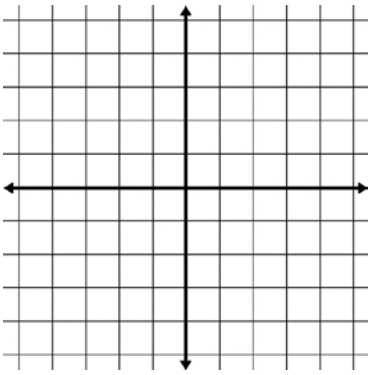
Write your prediction of what change you think will happen in part b.

Then graph part b and see if your prediction was correct.

(b) $f(x) = \sqrt[3]{x}$

1) $a(x) = \sqrt[3]{x - 4}$

2) $b(x) = \sqrt[3]{x + 3}$



What happened to the parent function when you subtracted 4 inside the symbol?

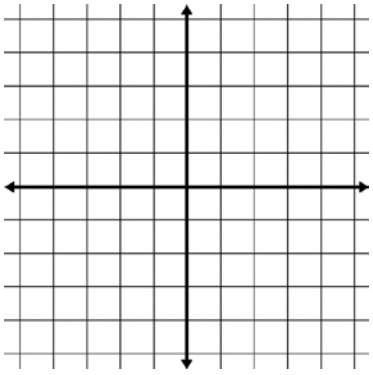
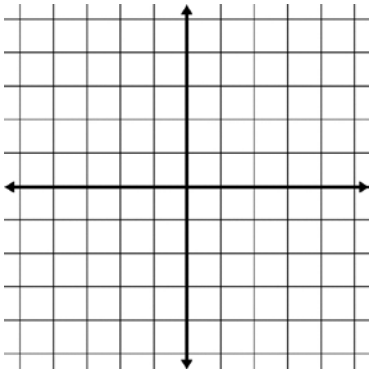
What happened to the parent function when you added 3 inside the symbol?

Function Notation	Type of transformation
$f(x - k)$	
$f(x + k)$	

PART III

Graph each parent function $f(x)$, and use a graphing calculator to graph $y = -f(x)$ in the same coordinate system.

Note: **You should have 2 graphs in each window. Sketch a copy of your screen.**

(a)		**(c)**
1) $f(x) = x^2$ 2) $a(x) = -x^2$ 	Write your prediction of what change you think will happen in part b. Then graph part b and see if your prediction was correct.	1) $f(x) = \sqrt[3]{x}$ 2) $d(x) = -\sqrt[3]{x}$ 

Describe the relationship between the graph of $y = f(x)$ and the graph of $y = -f(x)$.

Function Notation	**Type of transformation**
-f(x)	

PART IV

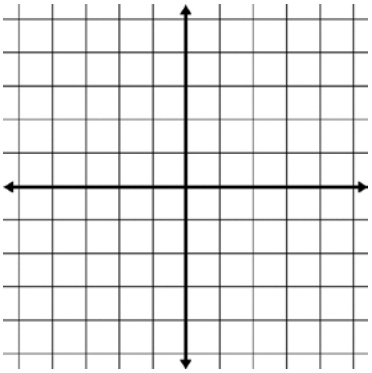
Graph each parent function $f(x)$, and use a graphing calculator to graph $y = a \bullet f(x)$ for $a = \frac{1}{4}$, and 2 in the same coordinate system.

Note: You should have 3 graphs in each window. Sketch a copy of your screen.

(a) $f(x) = |x|$

1) $a(x) = \frac{1}{4}|x|$

2) $b(x) = 2|x|$



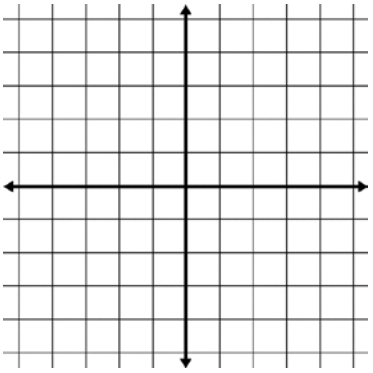
Write your prediction of what change you think will happen in part b.

Then graph part b and see if your prediction was correct

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

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

2) $q(x) = 2\sqrt{x}$



What happened to the parent graph when you multiplied by $\frac{1}{4}$?

What happened to the parent graph when you multiplied by 2?

Function Notation	Type of transformation
$a \bullet f(x)$, $a > 1$	
$a \bullet f(x)$, $a < 1$	