

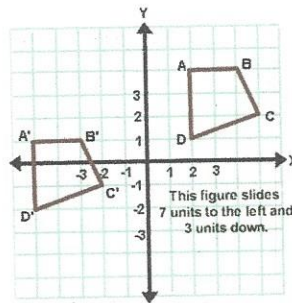
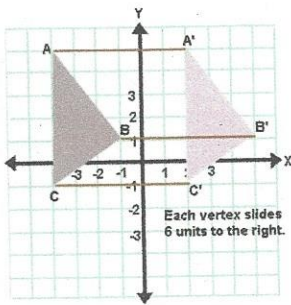
Essential Questions: What are transformations? How do we transform functions?

**Transformations**

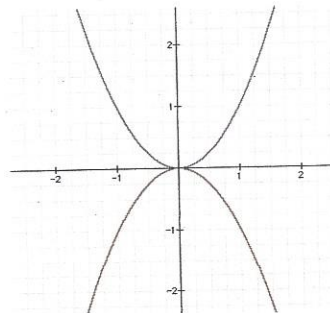
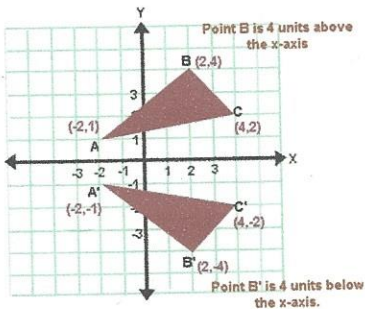
- a mathematical process that changes the size or position of a geometric figure. Transforming a function means to apply a change to a parent function to produce another function with similar characteristics.

**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.

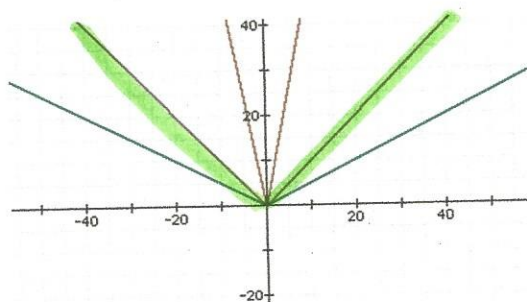
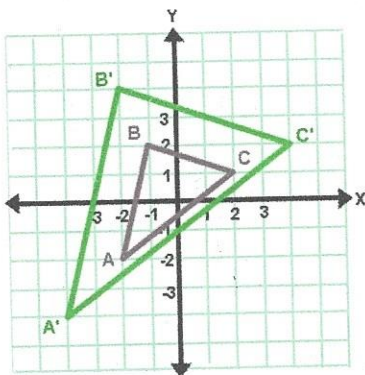


- REFLECTION:** a transformation in which a geometric figure or function is flipped over a line of reflection.



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

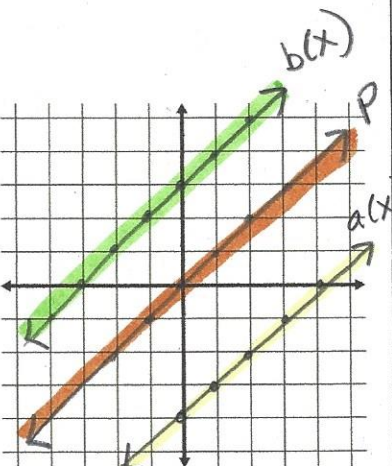
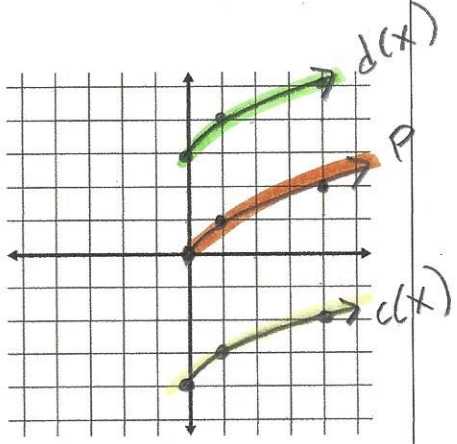
- DILATION:** a transformation in which a figure or function is either enlarged/stretched or shrunk/compressed.



**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.

<p>(a) <math>f(x) = x</math></p> <p>1) <math>a(x) = x - 4</math></p> <p>2) <math>b(x) = x + 3</math></p> 	<p>Write your prediction of what change you think will happen in part b. c.</p> <p>Then graph part b and see if your prediction was correct.</p>	<p>(c) <math>f(x) = \sqrt{x}</math></p> <p>1) <math>c(x) = \sqrt{x} - 4</math></p> <p>2) <math>d(x) = \sqrt{x} + 3</math></p> 
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What happened when you subtracted 4 from outside the parent function?

vertical shift 4 units down

What happened when you added 3 outside the parent function?

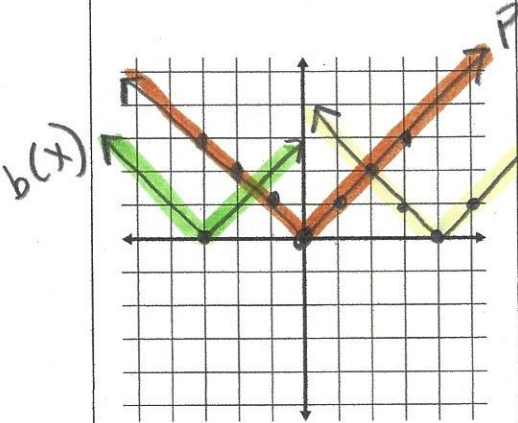
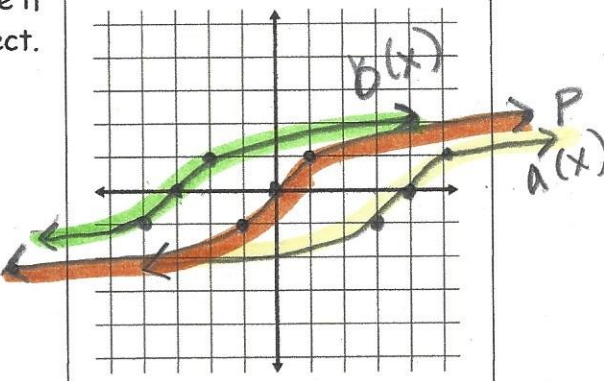
vertical shift 3 units up

Function Notation	Type of transformation
$f(x) + k$	vertical shift "k" units up
$f(x) - k$	vertical shift "k" units down

## 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.

<p>(a) <math>f(x) =  x </math></p> <p>1) <math>a(x) =  x-4 </math></p> <p>2) <math>b(x) =  x+3 </math></p>	<p>Write your prediction of what change you think will happen in part b.</p>	<p>(b) <math>f(x) = \sqrt[3]{x}</math></p> <p>1) <math>a(x) = \sqrt[3]{x-4}</math></p> <p>2) <math>b(x) = \sqrt[3]{x+3}</math></p>
	<p>Then graph part b and see if your prediction was correct.</p>	

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

horizontal shift 4 units right

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

horizontal shift 3 units left

Function Notation	Type of transformation
$f(x-k)$	horizontal shift "k" units right
$f(x+k)$	horizontal shift "k" units left



**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)

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.

~~(a)~~ (b)

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  $y = -f(x)$ .

reflection over the x-axis

Function Notation	Type of transformation
$-f(x)$	reflection over the x-axis

