

## Sec. 2.6 Families of Functions

## Vocabulary

-parent function: simplest form of a function family; no transformations

## Problem 1:

- a. How are  $y = x$  and  $y = x + 4$  related? How are their graphs related?

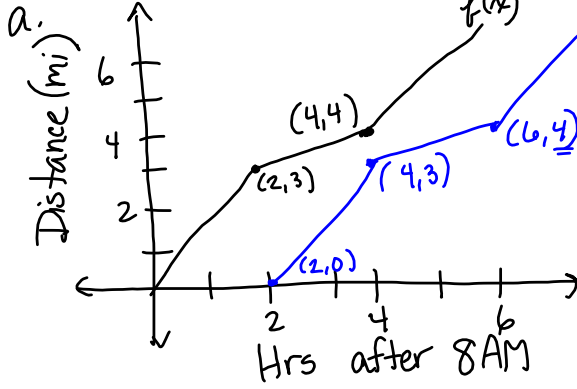
Each output for  $y = x + 4$  is 4 more than the corresponding output for  $y = x$ .

The graph of  $y = x + 4$  is the graph of  $y = x$  translated up four units

- b. What is the graph of  $y = -x^2$  translated down 3 units?

$$y = -x^2 - 3$$

Problem 2:



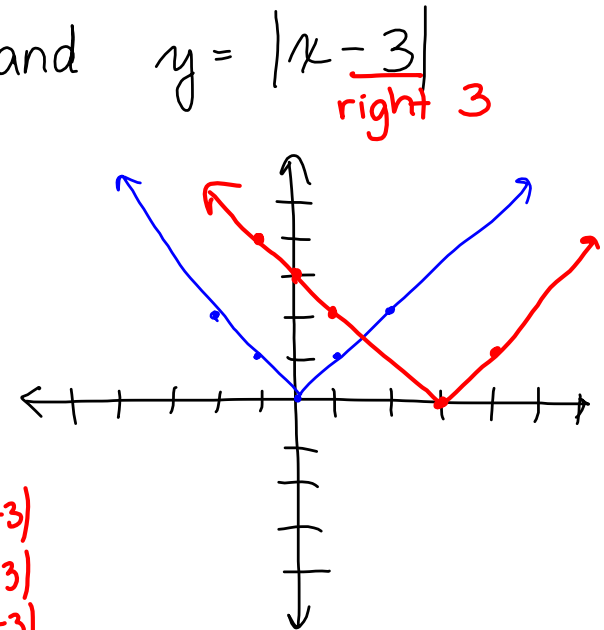
$x=2 \quad f(2-2)=f(0)=0$   
 $f(x-2) \quad x=$   
 The distance  $f(x)$  you will hike if you leave at 8 a.m.  
 If you leave at 10 a.m., what function represents the transformation?  
 $f(x-2)$

$x=4 : f(4-2)=f(2)=3$   
 $x=6 : f(6-2)=f(4)=4$

b. Graph  $y = |x|$  and  $y = |x-3|$

$y = |x|$

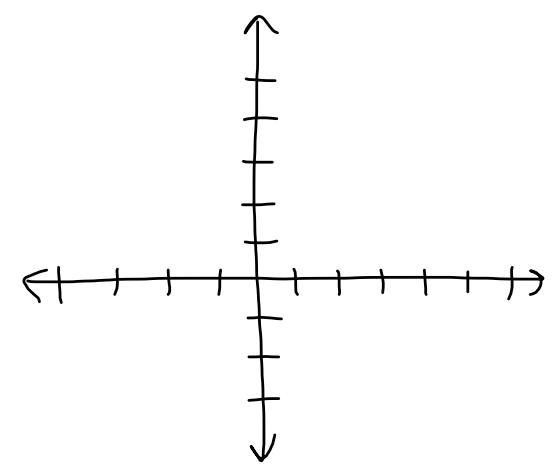
x	y
-2	2
-1	1
0	0
1	1
2	2



$y = |x-3|$

x	y	Calculation
0	3	$ 0-3 $
1	2	$ 1-3 $
3	0	$ 3-3 $
-1	4	$ -1-3 $
4	1	$ 4-3 $

c.  $y = x^2$  ;  $y = (x+2)^2$

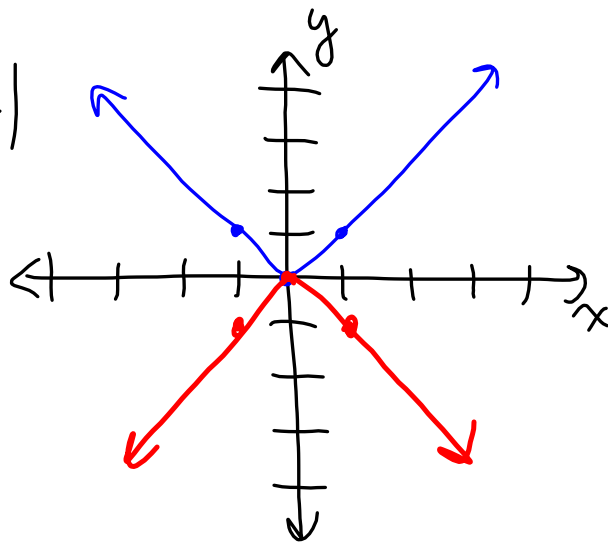


Problem 3:

a.  $y = |x|$ ;  $y = -|x|$

$x$	$y$
-1	1
0	0
1	1

$x$	$y$	
-1	-1	- -1
0	0	- 0
1	-1	- 1

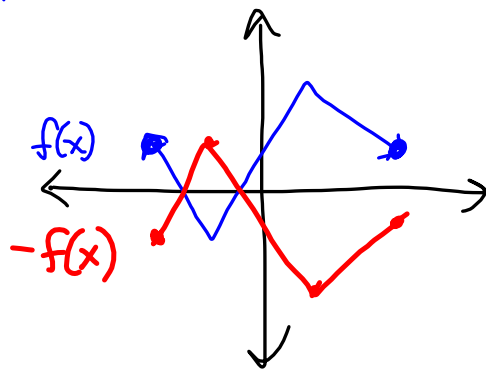


b. Let  $g(x)$  be the reflection of  $f(x) = 2x - 7$  in the  $x$ -axis. What is the function rule for  $g(x)$ ?

$$g(x) = -f(x) = -(2x - 7) = -2x + 7$$

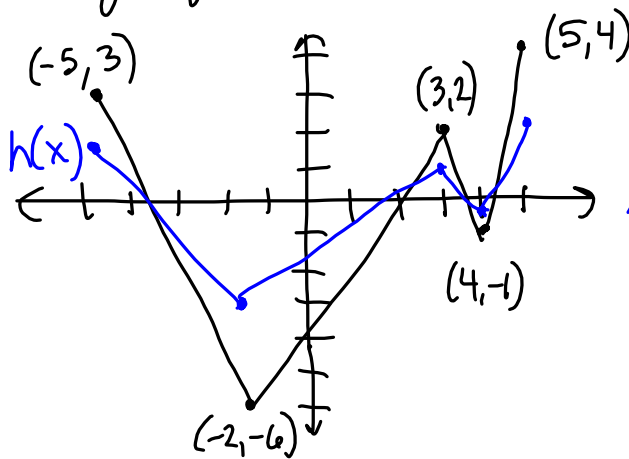
$$g(x) = -2x + 7$$

\* Reflection in the  
 $x$ -axis:  $-f(x)$   
 $y$ -axis:  $f(-x)$



## Problem 4:

The function,  $f(x)$  is shown. What is the graph of  $h(x) = 0.5f(x)$ ?



$\frac{1}{2} y$   
 $a f(x)$   
 vertical compression  
 $|a| < 1$   
 vertical stretch  
 $|a| > 1$

## Problem 5:

a. The function  $f(x) = 8x$ . The graph of  $g(x)$  is vertically compressed by a factor of 0.5 and reflected in the x-axis. What is  $g(x)$ ?

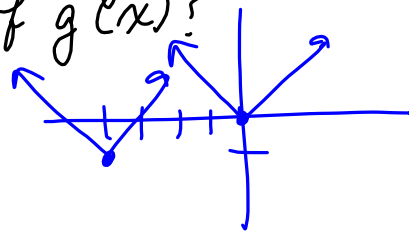
$$g(x) = -0.5f(x) = -0.5(8x) = -4x$$

$$g(x) = -4x$$

b. What transformations change the graph of  $f(x)$  to the graph of  $g(x)$ ?

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

$$g(x) = (x + 4)^3 - 1$$



horizontal translation left 4 units  
 vertical translation down 1 unit