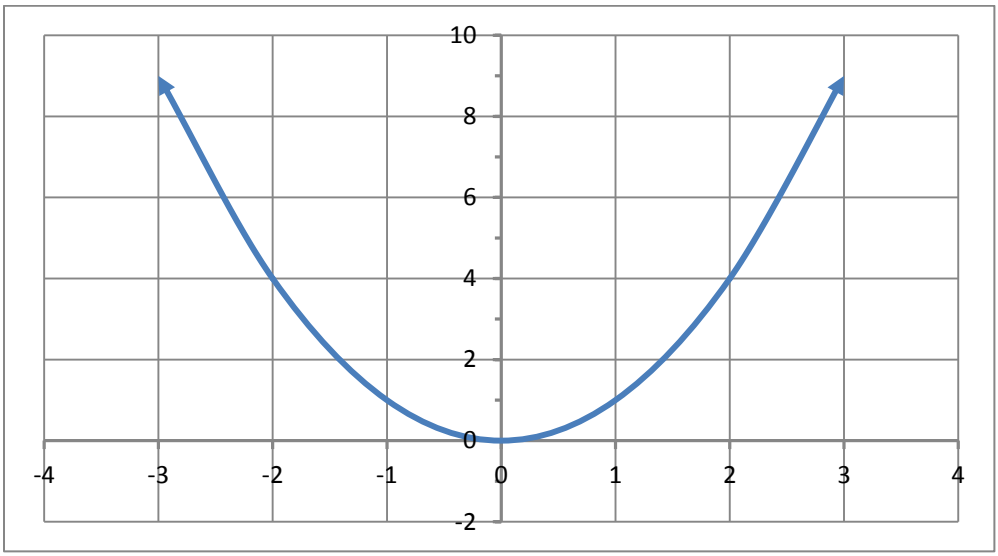
Math 111
Competency Assessment for Credit Unit 1
Shifting and Reflecting Functions

In this Competency Assessment, you will explore transformations of functions. For each part, you will look at a translation of a standard graph, and then formulate a general rule for the transformation. You will need to express each rule clearly and write in complete sentences.

1. a. Here is the graph of $f(x) = x^2$.



Complete the following table:

x	-2	-1	0	1	2
$f(x)$					

b. Write an expression for $f(x) + 3$ = _____. Then complete the table below.

x	-2	-1	0	1	2
$f(x) + 3$					

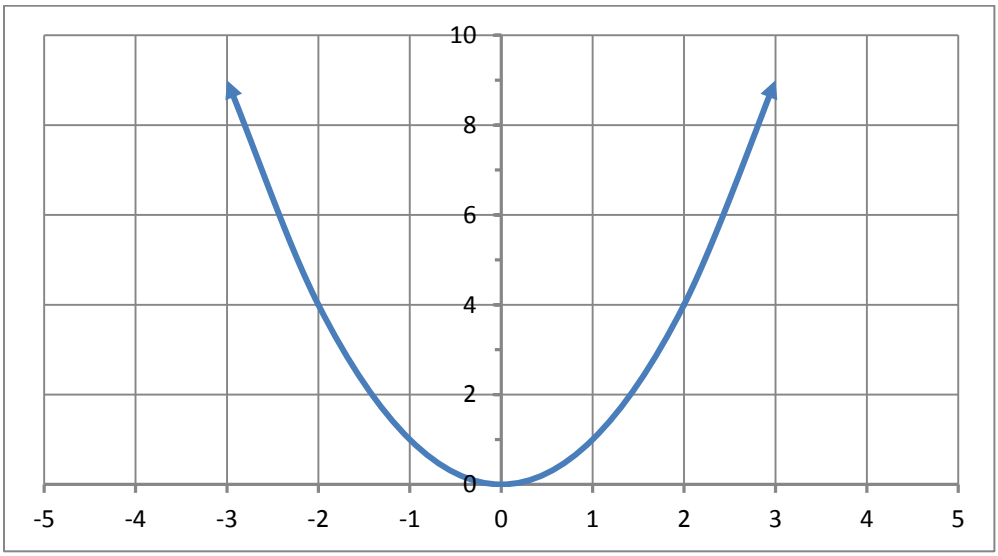
c. What do you think the graph of $f(x) + 3$ will look like, compared with $f(x)$?

d. Check your prediction and sketch the graph of $f(x) + 3$ with the graph of $f(x)$ in part (a) above. Label the graph as $f(x) + 3$

e. What will the graph of $f(x) - 2$ will look like? Sketch and label this graph above in part (a).

f. What do you think will be the result of adding or subtracting any number to the output $f(x)$, that is $f(x) + c = x^2 + c$ and $f(x) - c = x^2 - c$. Do you think this will work with any function? How do you know?

2. a. Consider again the graph of $f(x) = x^2$.



Write an expression for $f(x + 3)$ = _____. Then complete the table below.

x	-5	-4	-3	-2	-1
$f(x + 3)$					

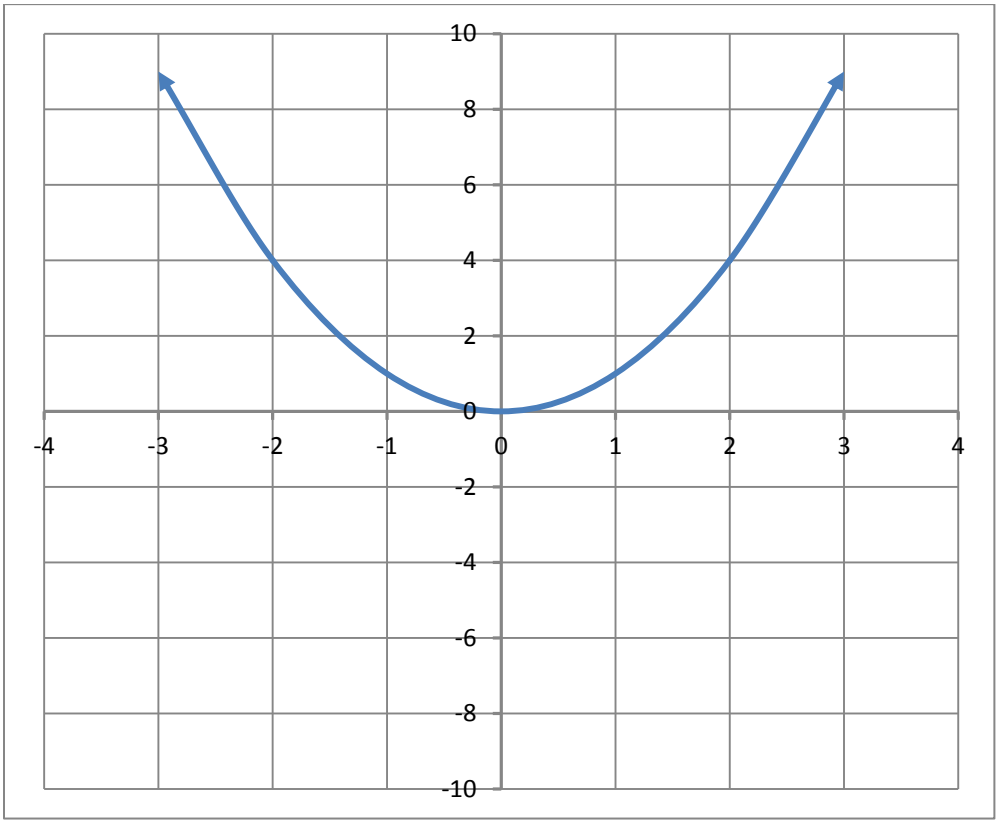
b. What do you think the graph of $f(x + 3)$ will look like, compared with $f(x)$?

c. Check your prediction and sketch the graph of $f(x + 3)$ with the graph of $f(x)$ in part (a) above.

d. What do you think will be the result of adding or subtracting any number to each input of $f(x)$, that is $f(x + c) = (x + c)^2$ and $f(x – c) = (x – c)^2$. Do you think this will work with any function? How do you know?

e. What will the graph of $f(x – 2)$ look like? Sketch this graph above in part (a).

3. Look again at $f(x) = x^2$.



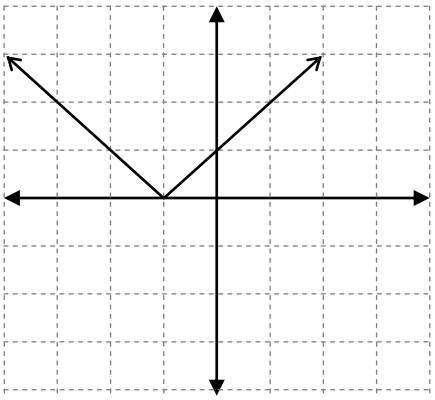
a. What do you think the graph of $2 \cdot f(x)$ = _____will look like, compared with $f(x)$? Sketch this graph above.

b. What do you think the graph of $\frac{1}{2} \cdot f(x)$ = _____will look like, compared with $f(x)$? Sketch this graph above.

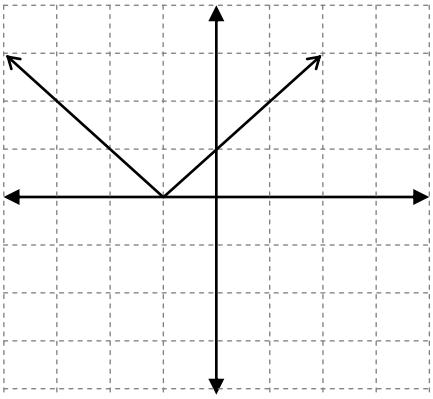
c. What do you think the graph of $-1 \cdot f(x)$ = _____will look like, compared with $f(x)$? Sketch this graph above.

d. In general, how will multiplying any number by $f(x)$ affect the graph; that is, $c \cdot f(x) = c \cdot x^2$ or $\frac{1}{c} \cdot f\ x\ = \frac{1}{c} \cdot x^2$. Do you think this will work with any function? How do you know?

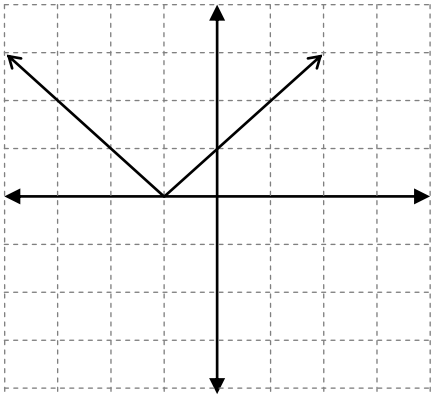
4. Apply what you learned in the previous problems to sketch the graph of each transformation, using the graph of $g(x)$ shown below.



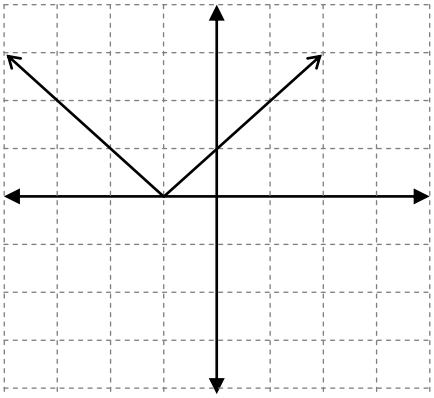
$-g(x)$



$g(x) - 4$



$g(x - 4)$



$g(x + 1) - 3$