Lesson 5

Combining Transformations

Warm-up - a. If $g(x)$ is a reflection of $f(x)$ in the y-axis, write the equation of $g(x)$ in terms of $f(x)$.

b. What points are invariant?

c. If $g(x)$ is a reflection of $f(x)$ in the x-axis, write the equation of $g(x)$ in terms of $f(x)$.

d. What points are invariant?

e. If $g(x)$ is a reflection of $f(x)$ in the line y=x, write the equation of $g(x)$ in terms of $f(x)$.

f. What points are invariant?

Combining Transformations

- We can combine the various transformations; right, left, up, down, stretches and reflections.

However, to simplify the procedure, always perform the transformations in the following order:

1. Stretch
2. Reflect
3. Translate

} In other words, multiply before addition/subtraction

The easiest form to think of is:

$$y = af[b(x-c)]+d$$

a is a vertical stretch about the x-axis by a factor of $|a|$

reflection in the x-axis if $a<0$

b is a horizontal stretch about the y-axis by a factor of $\left|\frac{1}{b}\right|$

reflection in the y-axis if $b<0$

c is a horizontal shift left or right depending on the sign of 'c'

Note 'c' must be read when the coefficient of x is 1

d is a vertical shift up or down depending on the sign of 'd'

Example 1: Given the graph of $y = f(x)$,

a. transform the graph of $f(x)$ to sketch the graph of $g(x) = f(x-4)+2$

b. transform the graph of $f(x)$ to sketch the graph of $h(x) = \frac{1}{2}f(x)-3$

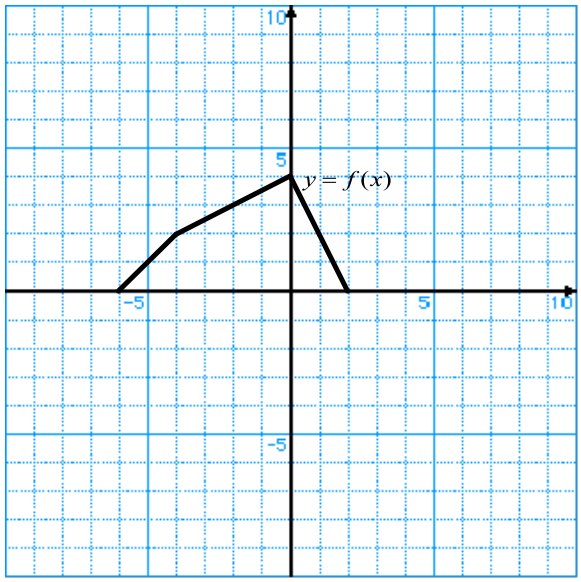
c. transform the graph of $f(x)$ to sketch the graph of $y = f(2x)+3$

Also, show a mapping of the points.

a. $(x, y) \rightarrow (\quad , \quad)$

b. $(x, y) \rightarrow (\quad , \quad)$

c. $(x, y) \rightarrow (\quad , \quad)$



Your turn: Given the graph of $y = f(x)$,

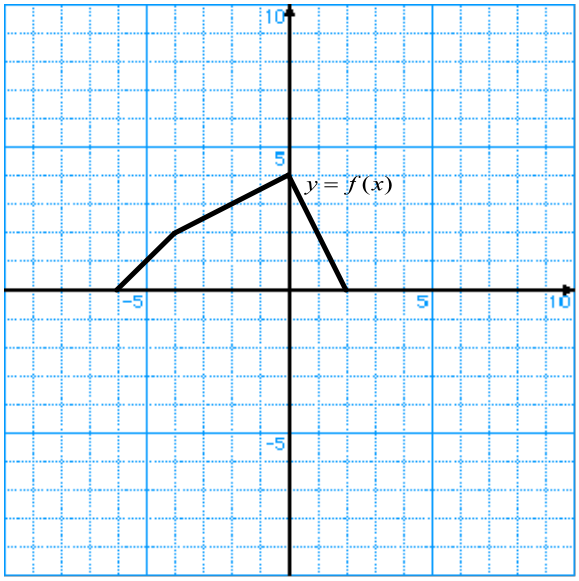
a. transform the graph of $f(x)$ to sketch the graph of $y = -2f(2x)$

b. transform the graph of $f(x)$ to sketch the graph of $y = f(-x) - 2$

Mapping of the points.

a. $(x, y) \rightarrow (\quad , \quad)$

b. $(x, y) \rightarrow (\quad , \quad)$

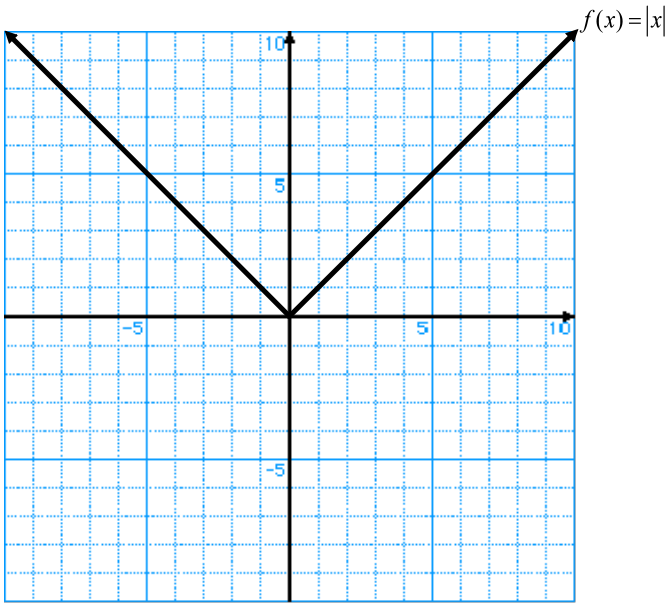


Try: Given the graph of $f(x)=|x|$,

a. transform the graph of $f(x)$ to sketch the graph of

$$g(x)=\frac{1}{3}f(4x-4)+6$$

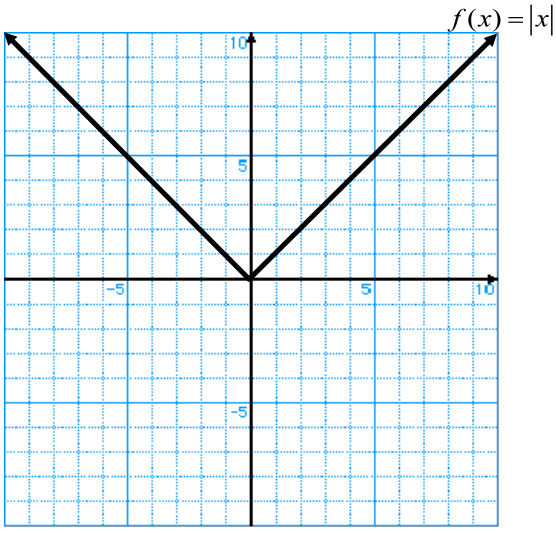
Use mapping: $(x, y)\rightarrow(\quad,\quad)$



Example 2: Describe the combination of transformations that would need to be applied to the function $f(x)=|x|$ in order to obtain the transformed function $g(x)=3f\left(\frac{1}{2}x\right)-6$. Write the corresponding function and sketch the graph of $g(x)$.

Description	Mapping
Vertical stretch by a factor of 3 about the x-axis.	$y \to 3y$

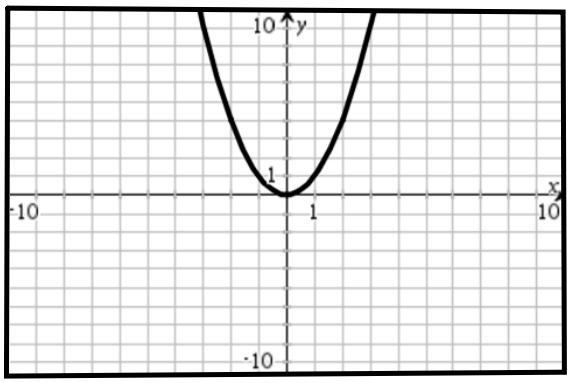
$(x, y) \to (\quad , \quad)$



Your Turn: Describe the combination of transformations that would need to be applied to the function $f(x)=x^2$ in order to obtain the transformed function $g(x)=-2f\left(\frac{1}{2}(x+4)\right)-3$. Write the corresponding function and sketch the graph of $g(x)$.

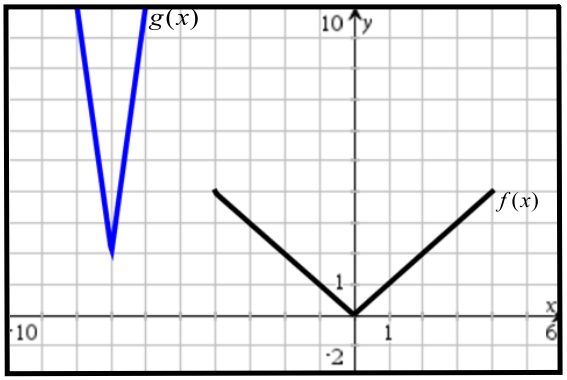
Description	Mapping

$(x, y) \rightarrow (\quad , \quad)$

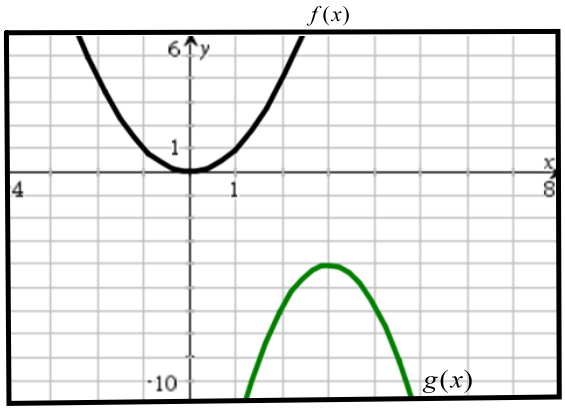


Example 3: The graph of the function $y = g(x)$ represents a transformation of the graph of $y = f(x)$. Determine the equation of $g(x)$ in the form $g(x) = af[b(x-h)]-k$. Explain your answer.

a.



b.



Can you write the actual function?

Homework

1. Transformations Quiz 2

2. Text Pages 38 - 43, Exercises # 1 - 11, 13a, 14, 15, C3.

Transformations Quiz 2a.doc

Attachments

Reflections Assignment 1.doc

Transformations Quiz 2a.doc