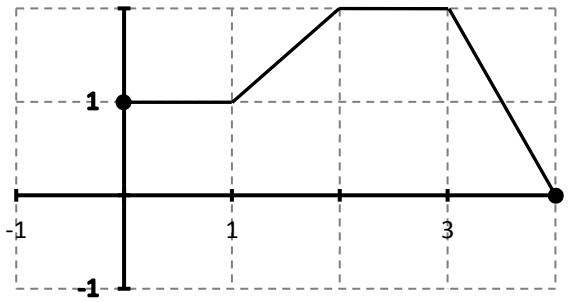
Handout 11: 2.9 Combinations of Transformations

1. The graph of $A(t)$ is below in heavy line. For each variation of *A* sketch the graph and state the domain and range.



a. $y = A(-t)$

b. $y = A(t-2)+1$

c. $y = -2A(t)$

d. $y = A\left(\frac{1}{4}t\right) - 1$

e. $y = A(2t+4)$

f. $y = \frac{1}{2}A(t+3)$

2. Graph each piecewise-defined function and state the range of each.

a. $f(x) = \begin{cases} -\frac{1}{x+3}, & x > -3 \\ \sqrt{-x-3}, & x \le -3 \end{cases}$

b. $g(x) = \begin{cases} \sin(-2x), & x < 0 \\ -2\sin(x), & x \ge 0 \end{cases}$

3. A toxic chemical cleanup company originally assumes that the concentration of a particular pollutant in a lake *t* hours after it has been introduced into the lake is approximated by the function $c(t) = \frac{2.56t+35}{1.8t+45}$. Later analysis shows this not to be the case, and that the actual function that describes the situation is a slight modification of the original function. Create a new function that more closely approximates the concentration of the pollutant in the lake if a particular concentration is attained 2 hours sooner than originally thought, and the concentration is only two-thirds that originally thought.

4. The profit *P* per week on a certain product is given by the model $P(x) = 80 + 20x - 0.5x^2$, $0 \le x \le 20$, where x is the amount spent on advertising. In this model, x and *P* are both measured in hundreds of dollars.

a. The business estimates that taxes and operating costs will increase by an average of $2,500 per week during the next year. Rewrite the profit equation to reflect this expected decrease in profits. Identify the type of transformation made to the graph of the equation.

b. Rewrite the original profit equation so that *X* measures advertising expenditures in dollars. Describe the transformation made to the graph of the profit equation.

5. The number of horse power *H* required to overcome wind drag on a certain automobile is approximated by $H(x) = 0.002x^2 + 0.005x - 0.029$, $10 \le x \le 100$, where x is the speed of the car in miles per hour. Rewrite the power function so that *X* represents the speed in kilometers per hour. Describe the transformation made to the graph of the power function. (There are approximately 1.6 kilometers in one mile.)

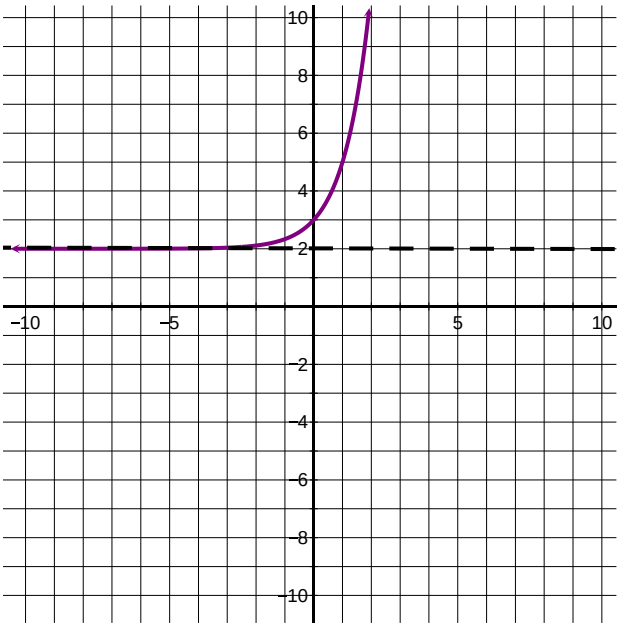
6. Suppose you have a function $f(x)$ and you want to find an equation for a function which is symmetric with $f(x)$ about the line $x = 2$. Write an equation for this other function as a transformation of $f(x)$.

7. Suppose the domain of $g(x)$ is $\{x| -2 < x < 5\}$ and the range of $g(x)$ is $\{y|y \geq 1\}$. Find the domain and range of

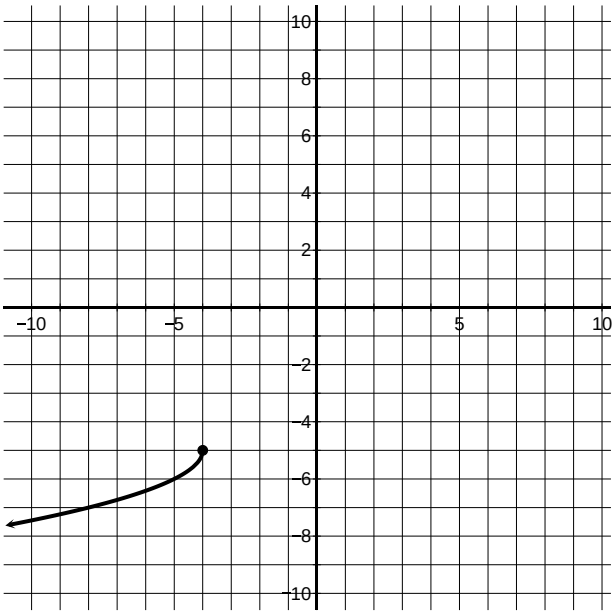
a. $y = 2g(x) + 1$ b. $y = g(2x + 2)$ c. $y = 4g(-x)$ d. $y = \frac{1}{4}g(x + 1)$

8. Write an equation for each of the functions graphed below. Some may be piecewise-defined functions.

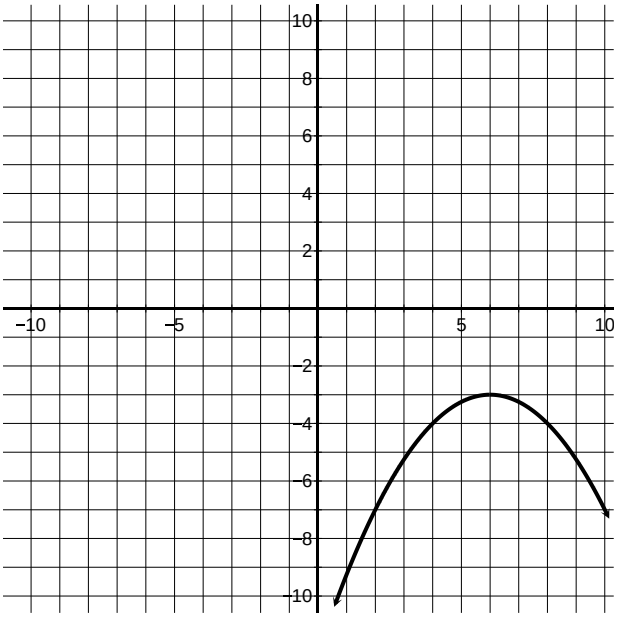
a.



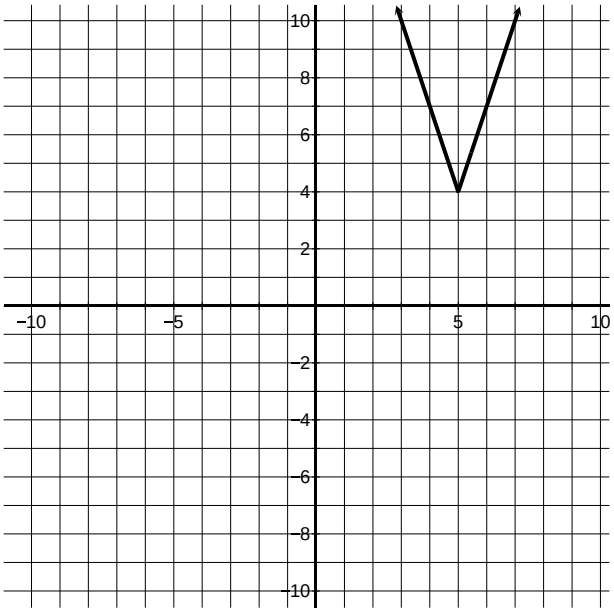
b.



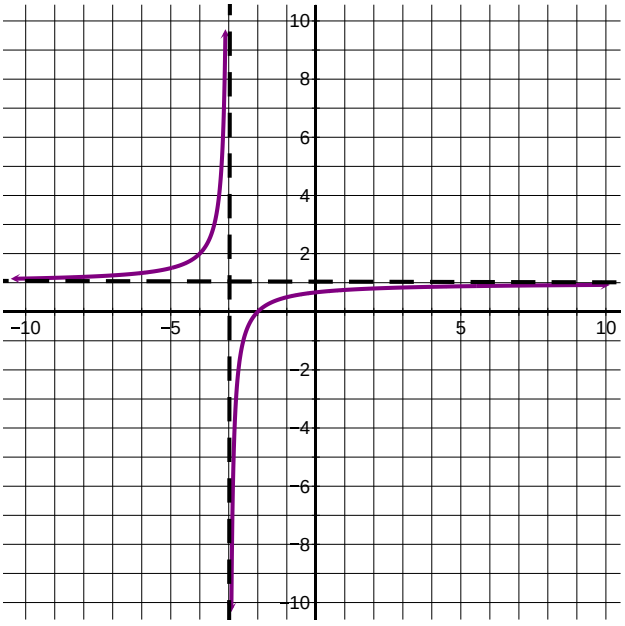
c.



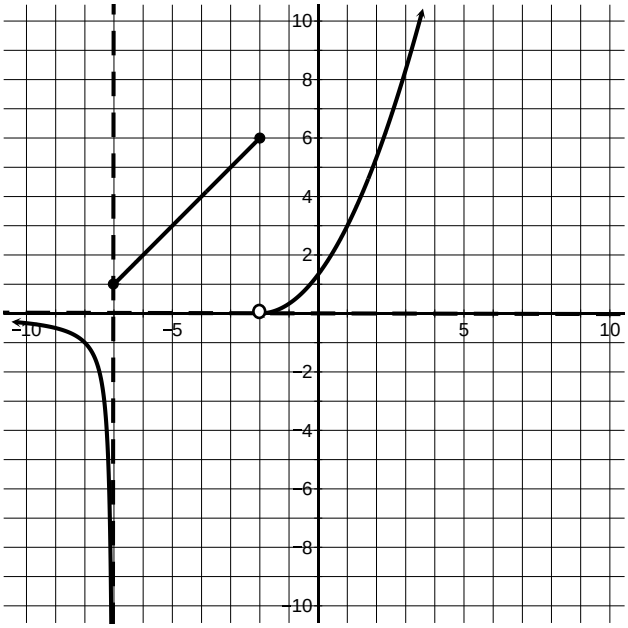
d.



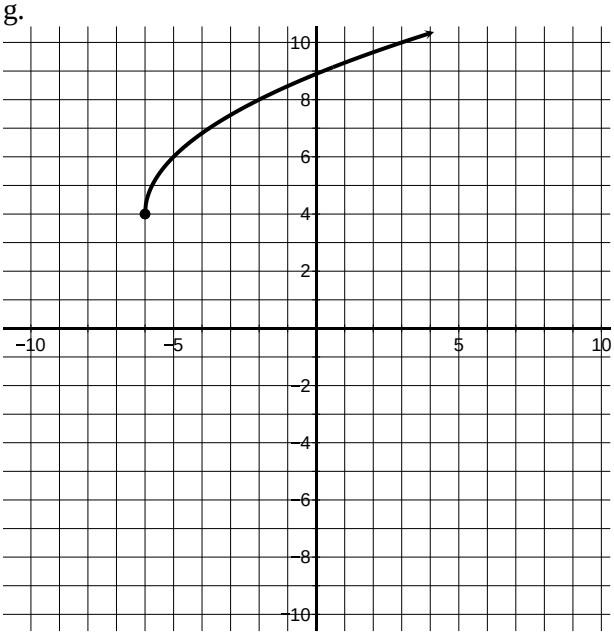
e.


10
8
6
4
2
−10
−5
5
10
−2
−4
−6
−8
−10

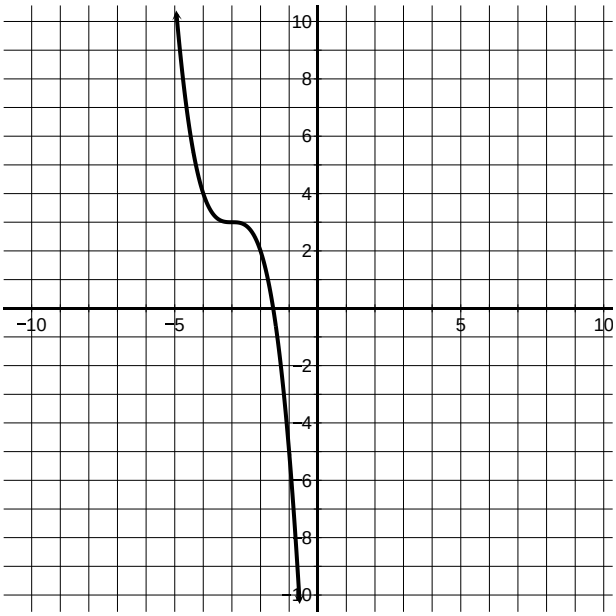
f.


10
8
6
4
2
−10
−5
5
10
−2
−4
−6
−8
−10

g.


10
8
6
4
2
−10
−5
5
10
−2
−4
−6
−8
−10

h.


10
8
6
4
2
−10
−5
5
10
−2
−4
−6
−8
−10