

For our test on functions, you should be able to:

- ✓ Determine if a relation is a function
- ✓ Determine the domain, range and zeroes of a function
- ✓ Determine the inverse of a function
- ✓ Determine if a function is one-to-one
- ✓ Find the type of symmetry for a given equation, algebraically.
- ✓ Determine if a function is even or odd
- ✓ Perform operations on functions including function composition
- ✓ Evaluate functions given graphs and tables
- ✓ Sketch graphs of functions involving transformations
- ✓ Determine how changes in a parent function impact the graph of the function
- ✓ Graph and interpret piecewise functions

1. The radius  $r$ , in inches, of a spherical balloon is related to the volume,  $V$ , by  $r(V) = \sqrt[3]{\frac{3V}{4\pi}}$ . Air is pumped into the balloon so the volume after  $t$  seconds is given by  $V(t) = 10 + 20t$ .

a.) Find the composite function  $r(V(t))$

b.) Find the time when the radius reaches 10 inches.

2. Describe the transformation of each function from its parent.

a.)  $f(x) = 4(x+1)^2 - 5$

b.)  $h(x) = -2|x-4| + 3$

c.)  $g(x) = \frac{1}{2}x^3$

3. If  $f(x) = \frac{x}{2+x}$  and  $g(x) = \frac{2x}{1-x}$  find

a.)  $g(f(x))$

b.)  $f(g(x))$

c.) What does this tell you about the relation between  $f(x)$  and  $g(x)$ ? Be specific.

4. Find the domain for each function.

a.)  $f(x) = \frac{x-4}{x+2}$

b.)  $f(x) = \frac{x}{x^2-9}$

c.)  $h(x) = \frac{2x-1}{\sqrt{3x+1}}$

5. If  $f(x) = 3x - 5$ , find  $\frac{f(x) - f(a)}{x - a}$

6. Let  $f(x) = 3x - 1$   $g(x) = x^2 - 2$   $h(x) = \sqrt{10 - 2x}$   $k(x) = \frac{1}{3x - 4}$ , find

a.)  $f(7)$

b.)  $k(-4)$

c.)  $f^{-1}(x)$

d.)  $(h+g)(7)$

e.)  $(g \circ f)(x)$

f.) Domain for  $h(x)$

g.)  $g(g^{-1}(x))$

h.)  $f(k(x))$

7. Find the inverse of  $f(x) = x^2 - 2$ . Graph both. How are they related?

8. Find the inverse of  $k(x) = \frac{x-4}{x-2}$ . Note any domain restrictions.

9. Use the graph below.

a.) Graph the relation.  $f(x) = \begin{cases} x+5 & x < -2 \\ x^2 + 2x + 3 & x \geq -2 \end{cases}$

b.) Is it a function?

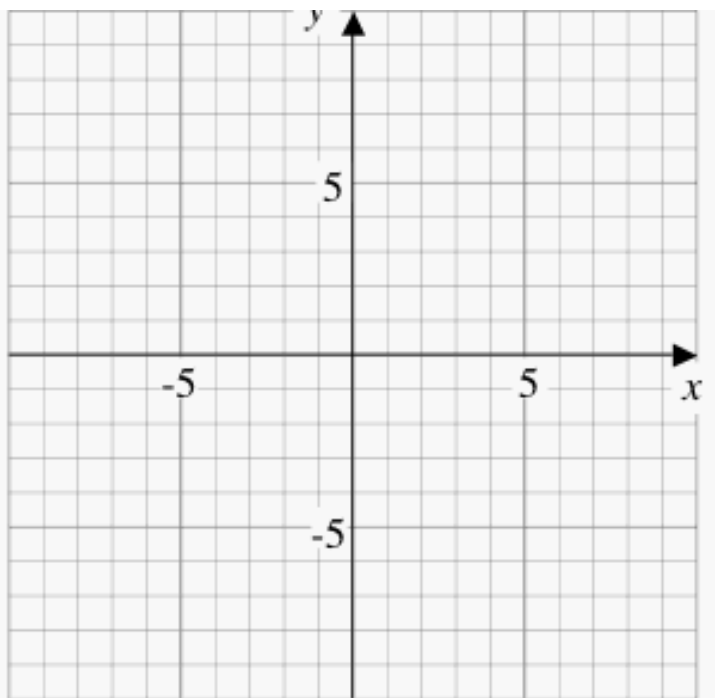
c.)  $f(3) =$

d.)  $f(-4) =$

e.)  $f(-2)$

f.) Domain?

g.) Range?

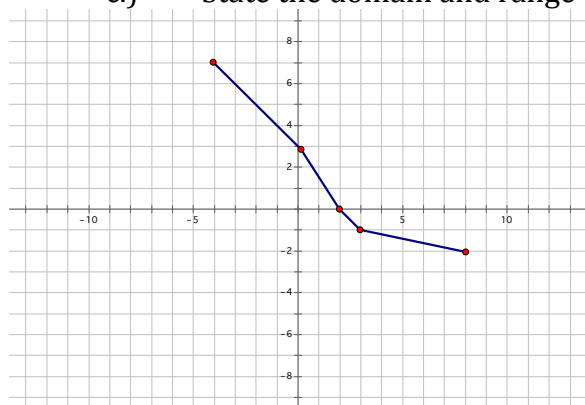


10. Use the graph of  $f(x)$ .

a.) State the domain and range of  $f$ .

b.) Sketch the inverse

c.) State the domain and range of the inverse.



11. If  $f$  and  $g$  are inverse functions,  $f(-2) = 3$  and  $f(4) = -2$ , find  $g(-2)$ .

12. Use the table to find the indicated quantities.

X	0	1	2	3	4	5	6	7	8	9
F(x)	8	0	7	4	2	6	5	3	9	1

a.) Find  $f(1)$

b.) Solve  $f(x)=3$

c.) Find  $f^{-1}(0)$

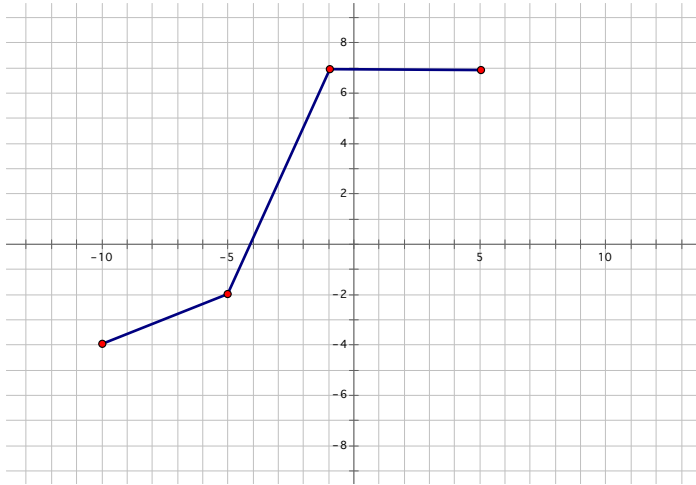
d.) Solve  $f^{-1}(x) = 7$

13. Determine if the following functions are even or odd. Explain.

a.)  $|x+3| = f(x)$

b.)  $g(x) = 1/5x$

14. Use the function  $f(x)$  sketched below.



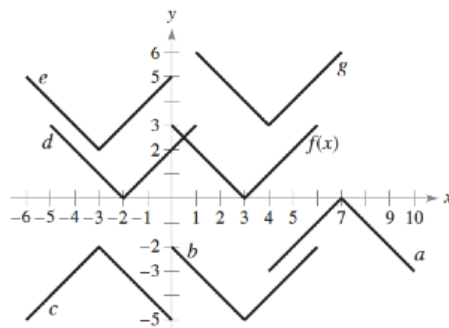
a.) Graph  $-f(x)$

b.) Graph  $f(x+3)$

c.) Graph  $|f(x)|$

d.) Graph  $1/2f(x) + 2$

Use the graph of  $y = f(x)$  to match the function with its graph.



1)  $g(x) = f(x+5)$

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

3)  $g(x) = f(x-1) + 3$

4)  $g(x) = f(x) - 5$

15.

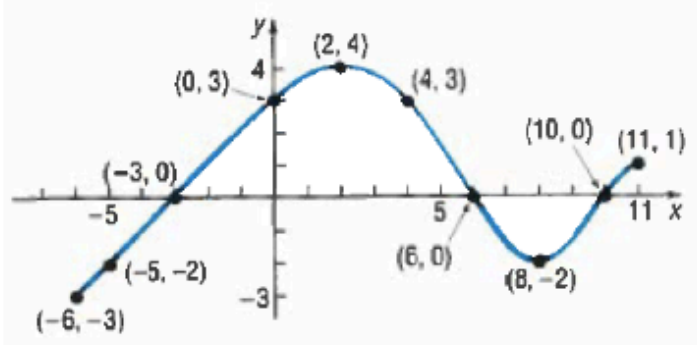
3. An automobile race track is to be constructed in the shape of two parallel section connected by two semicircles. The track (one round trip) is to be exactly 2.5 miles in length.



- Write an equation for the area of the shaded rectangular region as a function of the radius  $r$ .
- Draw a complete graph of the function in part a.
- What values of  $r$  make sense in this problem situation?
- Use a graph to determine the value of the radius that produces the maximum rectangular area. What is the maximum rectangular area?

16.

Use the graph of the given function  $f$  to answer Questions 1 – 13.



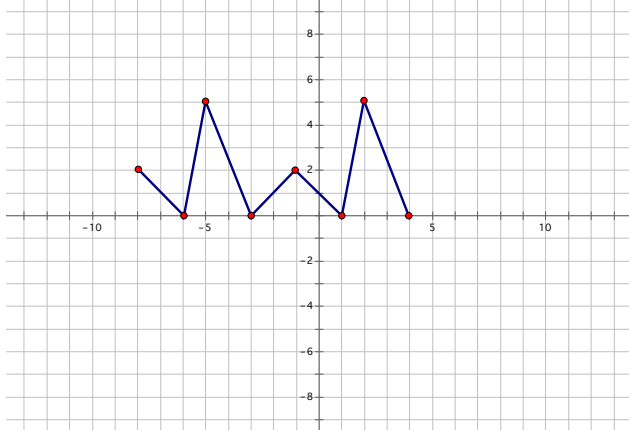
1	Find $f(0)$ and $f(-6)$ .
2	Find $f(6)$ and $f(11)$
3	Is $f(3)$ positive or negative? Explain your reasoning.
4	Is $f(-4)$ positive or negative? Explain your reasoning.
5	For what numbers $x$ is $f(x) = 0$ ?
6	For what numbers $x$ is $f(x) > 0$ ?
7	What is the domain of $f$ ?
8	What is the range of $f$ ?
9	What are the $x$ -intercepts?
10	What are the $y$ -intercepts?
11	For how many values of $x$ does $f(x) = \frac{1}{2}$ ?
12	How often does the line $x = 5$ intersect the graph of $f$ ?
13	For what values of $x$ does $f(x) = 3$ ?

17. a.) Find the axis of symmetry for  $f(x) = 3x^2 - 8x + 7$ .

b.) Find the point of symmetry for  $p(x) = 2x^3 + 12x^2 + 9$



18. Use the graph of  $f(x)$  below.



- Is the function periodic? Explain.
- If so, what is the fundamental period?
- What is the amplitude of the function?
- Find  $f(32)$

19. Determine if the following equations are symmetric over (a) the x-axis (b) the y-axis (c) (0,0) (d) over  $y = x$

a.)  $y = |x| - 9$

b.)  $x^2 + y^2 = 12$