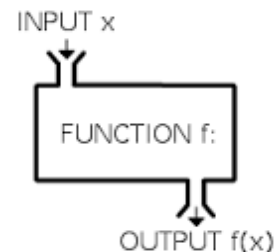


Unit 3.1-3.6 and 6.1-6.2 Functions



By the end of this unit, you should be able to:

- ☐ determine whether a relation (equation or graph) represents a function
- ☐ find the value of a function
- ☐ find the domain of a function
- ☐ find the sum, difference, product and quotient of two functions
- ☐ find the difference quotient
- ☐ find domain, range, intercepts, and other information from the graph or equation of a function
- ☐ determine if a function is even or odd (from an equation or a graph)
- ☐ determine if a function is decreasing, increasing, or constant
- ☐ use a graph to find local maxima and local minima
- ☐ find the average rate of change of a function
- ☐ find the equation of the secant line
- ☐ graph all “base” functions using transformations
- ☐ graph piecewise functions
- ☐ build a function given a situation
- ☐ find a composite function
- ☐ find the domain of a composite function
- ☐ determine whether a function is one-to-one
- ☐ determine the inverse of a function given a graph or equation
- ☐ graph the inverse function

Assignments:

3.1 – pg. 220 #39bc, 41de, 43g, 45fh, 47, 51, 55, 57, 59, 61ab, 63c, 65d, 67e, 69g, 73, 75
3.2 – pg. 227 #9, 11, 14, 23, 25
3.3 – pg. 239 #21, 27, 29, 33, 35, 37, 41, 45, 47, 53, 59, 61, 63, 65
3.5 – pg. 261 #27, 29, 35, 39, 46, 50, 56, 57, 59, 65d, 66e, 67f, 68g
3.4 – pg. 249 #25, 27, 31c, 33c, 35c, 36c
3.6 – pg. 267 #1, 7, 9, 15
6.1 – pg. 407 #7, 9, 11ab, 17d, 19ac, 21-27odd, 33ac, 35bd, 41ab, 47, 49, 51, 53, 55, 57
6.2 – pg. 419 #9-21odd, 33, 35, 39, 41, 49, 51, 53, 59, 61, 65

Review Problems

1. Find the domain of each function.

a) $f(x) = \frac{1}{\sqrt{x+8}}$

b) $g(x) = \frac{\sqrt{x-1}}{x^2 - 3x - 10}$

c) $h(x) = \sqrt{10 + |x|}$

2. Given $f(x) = \frac{1}{x}$ and $g(x) = x^2 + 4x - 60$, find the following.

a) $(f \cdot g)(x)$

b) $(f + g)(5)$

c) $(f \circ f)(10)$

d) $(f \circ g)(x)$

e) What is the domain of $(g \circ f)(x)$?

f) Is $f(x)$ even, odd, or neither? Explain.

g) Is $g(x)$ even, odd, or neither? Explain.

h) Is $f(x)$ one-to-one? Explain.

i) Is $g(x)$ one-to-one? Explain.

3. Graph the piecewise function. $f(x) = \begin{cases} 2, & x < -1 \\ x^2, & x = -1 \\ \frac{1}{x}, & x > -1 \end{cases}$

4. Given the functions $f(x)$ and $g(x)$, find the following.

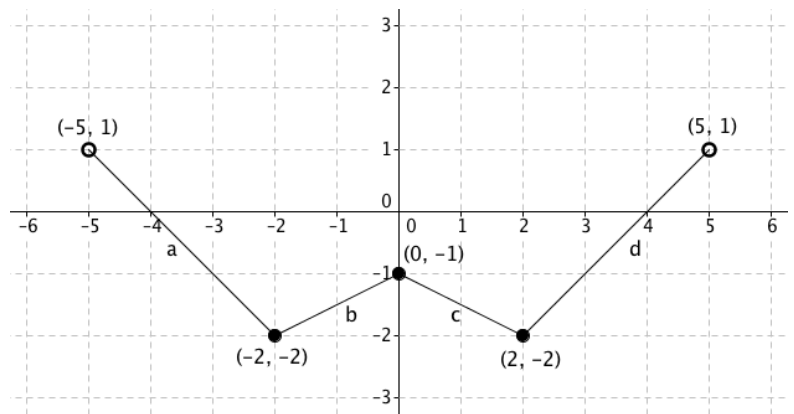
x	-3	1	2	9
$f(x)$	4	-5	0	4

x	-6	0	2	3
$g(x)$	4	9	-3	1

- $(f \circ g)(2)$
- Is $g(x)$ even, odd, or neither? Explain.
- Is $f(x)$ one-to-one? Explain.

5. Find and simplify the difference quotient of f , $\frac{f(x+h)-f(x)}{h}$, $h \neq 0$, for the function $f(x) = 2x^2 + 5$.

6. The function $f(x)$ is graphed below.



- State the domain.
- State the range.
- List the y -intercept(s).
- List the x -intercept(s).
- Find $f(4)$.
- For what values of x does $f(x) = -2$?
- For what values of x is $f(x) \geq 0$?
Give your answer in interval notation.
- Over what interval(s) is f decreasing?
- Over what interval(s) is f increasing?
- Graph $f^{-1}(x)$.
- List the transformations used to graph $F(x) = -3f(x+4) - 1$ from the original function F .
- Graph $F(x) = -3f(x+4) - 1$.
- Is $f(x)$ even, odd, or neither? Explain.
- Is $f(x)$ one-to-one? Explain.

7. Verify, using compositions, that $f(x) = 3x - 2$ and $g(x) = \frac{x+2}{3}$ are inverse functions, or that they are not.

8. Given $f(x) = \frac{-x+3}{8x+5}$ is one-to-one, find

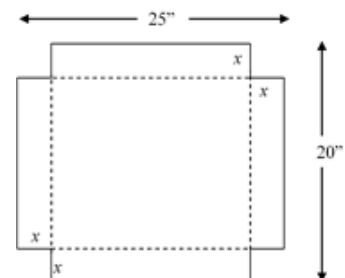
- the inverse f^{-1}
- the domain of f^{-1}
- the range of f^{-1}

9. Given $f(x) = 2x^2 - x + 1$, find the following.

- The average rate of change from $x = 2$ to $x = 4$.
- The equation of the secant line containing $(2, f(2))$ and $(4, f(4))$.

10. Suppose you wanted to make an open-topped box out of a flat piece of cardboard that is 25" long by 20" wide. You cut a square out of each corner, all the same size, then fold up the flaps to form the box, as illustrated below.

- Express the volume of the box, V , as a function of the length x of the side of the square cut from each corner.
- What is the volume if a 3-ince square is cut out?
- Graph the volume function on your calculator. Find the value of x that maximizes the volume.



11. A right triangle has one vertex on the graph of $y = x^2$ at (x, y) , another at the origin, and the third on the positive y -axis at $(0, y)$.

- Express the area A of the triangle as a function of x .
- What is the domain of A ?