## Section 1.4

**Definition of Function:** A function f from a set A to a set B is a relation that assigns to each element x in the set A exactly one element y in the set B. The set A is the **domain** (or set of inputs) of the function f, and the set B contains the **range** (or set of outputs).

## Characteristics of a Function from Set A to Set B

- a) Each element in A must be matched with an element in B.
- b) Some elements in B may not be matched with any element in A.
- c) Two or more elements in A may be matched up with the same element in B.
- d) An element in A (the domain) cannot be matched with different elements in B.

## **Function Terminology**

**Function:** A function is a relationship between two variables such that to each value of the independent variable there corresponds exactly one value of the dependent variable.

**Function Notation:** y = f(x); f is the name of the function, y is the **dependent variable**, x is the **independent variable**, and f(x) is the value of the function at x.

**Domain:** The domain of a function is the set of all values (inputs) of the independent variable for which the function is defined. If x is in the domain of f, f is said to be defined at x. If x is not in the domain of f, f is said to be undefined at x.

**Range:** The range of a function is the set of all values (outputs) assumed by the dependent variable (that is, the set of all function values).

**Implied Domain:** If f is defined by an algebraic expression and the domain is not specified, the implied domain consists of all real numbers for which the expression is defined.

**Problem 1.** Let  $A = \{a, b, c\}$ ,  $B = \{0, 1, 2, 3\}$ . Which sets of ordered pairs represent functions from A to B?

- a)  $\{(a,1),(c,2),(c,3),(b,3)\}$
- b)  $\{(a,1),(b,2),(c,3)\}$
- c)  $\{(1,a),(0,a),(2,c),(3,b)\}$
- d)  $\{(c,0),(b,0),(a,3)\}$

**Problem 2.** Determine whether the equation represents y as a function of x.

a) 
$$x + y^2 = 4$$

b) 
$$(x+3)^2 + y^2 = 1$$

c) 
$$|y| = 4 - x$$

d) 
$$y = -5$$

**Problem 3.** Evaluate the function at each specified value of the independent variable and simplify.

a) 
$$h(t) = t^2 - 2t$$
,  $h(2)$ ,  $h(-1)$ ,  $h(x+2)$ 

b) 
$$q(x) = \frac{1}{x^2 - 9}$$
,  $q(3)$ ,  $q(y + 3)$ 

c) 
$$f(x) = \begin{cases} 2x + 1, & x < 0 \\ 2x + 2, & x \ge 0 \end{cases}$$
,  $f(2)$ ,  $f(-2)$ 

d) 
$$f(x) = \begin{cases} 2 - 3x, & x \le -3 \\ 0, & -3 < x \le 3, \\ 2x^2 - 8, & x > 3 \end{cases}$$
  $f(-3), f(-1), f(4)$ 

**Problem 4.** In the following exercises, find the values of x for which f(x) = g(x).

a) 
$$f(x) = x^4 - 2x^2$$
,  $g(x) = 2x^2$ 

b) 
$$f(x) = \sqrt{x} - 4$$
,  $g(x) = 2 - x$ 

**Problem 5.** Find the domain of the function.

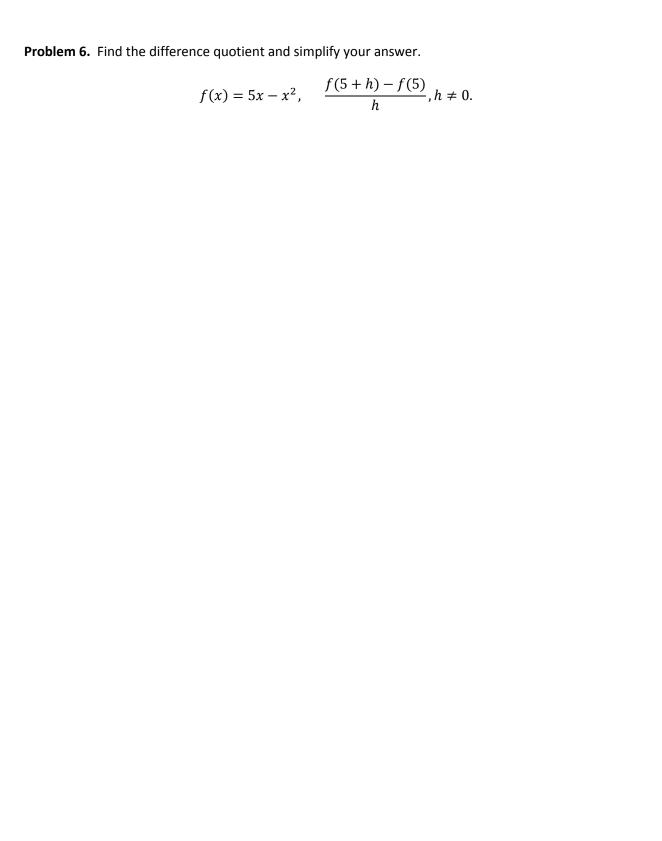
a) 
$$g(x) = 1 - 2x^2$$

b) 
$$f(t) = \sqrt[3]{t+4}$$

c) 
$$h(x) = \frac{3}{x^2 + 3x + 2}$$

$$d) \quad f(x) = \frac{\sqrt{x+6}}{x+6}$$

e) 
$$f(x) = \frac{x-5}{\sqrt{x^2-9}}$$



Homework: Read section 1.4, do #7, 9, 11, 12, 18, 19, 23-35 (odd), 39, 43, 45, 51, 53, 57, 59, 71 (the quiz for this section will be similar to these problems)