Section 2.1 Properties of Functions

A function is a rule that assigns to each element from one set exactly one element from another set. (Every *x*-value has only one *y*-value).

The set of all possible values of the independent variable in a function is called the domain of the function, and the resulting set of possible values of the dependent variable is called the range.

A function can be represented in a variety of ways. For example, a listing of ordered pairs, in mapping notation, an input/output table, an equation, and as a graph.

To determine if a relation is a function:

- **To identify from a list of ordered pairs, from a table, or from a mapping, make sure every *x*-value has only one corresponding *y*-value.**
- **To identify from an equation, make sure no *y*-values are raised to an even power, no absolute values of *y*-values, and no $\pm f(x)$.**
- **To identify from a graph, use the Vertical Line Test. (Every vertical line intersects the graph in at most one point).**

Work #1 – 3

Domain of a Function

To determine the domain of a function as defined by an equation, start with the set of all real numbers then look for any restrictions.

- **If the equation has a denominator, exclude any numbers that give a zero denominator. (set denominator = 0, solve)**

- **If the equation has a radical of even index, exclude any numbers that cause the expression inside the radical to be negative. (set radicand ≥ 0)**

Work #4 – 7

Basic Operations with Functions

Sum	$(f+g)(x) = f(x) + g(x)$
Difference	$(f-g)(x) = f(x) - g(x)$
Product	$(f \cdot g)(x) = f(x) \cdot g(x)$
Quotient	$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$, if $g(x) \neq 0$

The expression $\frac{f(x+h) - f(x)}{h}$ is called the difference quotient. (It is used in the definition of derivative in calculus).

Work #8 – 13