

PC Section 1.2 Functions

Objectives: Determine if a relation is a function; find function values; find domain of a function; piecewise-defined functions; difference quotient

A **relation** is a set of ordered pairs.

- The set of all first coordinates is called the **domain** of the relation.
- The set of all second coordinates is called the **range** of the relation.

A relation 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.

A relation is a **function** if each element of the domain is paired with exactly (only) one element of the range. (**Every x -value has only one y -value**).

For each element x of a function, the corresponding element y is called the **value** of the function at x , or the **image** of x .

For a function $y = f(x)$:

- x is called the **independent variable** (argument)
- y is called the **dependent variable**

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**. (If no vertical line crosses the graph more once, then a function).**

Work #1 – 5

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 #6 – 11

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 #12 – 14

Piecewise-defined functions

Domain is split – more than one equation is used to define the function.

$$f(x) = \begin{cases} x & x < 5 \\ x^2 & x \geq 5 \end{cases}$$

Work #15-18