

1.1 Functions

Learning Goal: We are learning to represent and describe functions and their characteristics.

There are some people who argue that mathematics has just two basic blocks: Numbers and Operations. This course is concerned with functions which can be considered number generators. A function takes a given number, and using mathematical operations generates another number. We will be examining the **relationship** between the given numbers, and the generated numbers for various functions.

Definition 1.1.1

A **Function** is

Pictures

Vertical Line Test

Arrow Diagrams

Definition 1.1.2

Domain of a Function:

Range of a Function:

Function Notation

We use the notation $f(x)$ to “name” a function. This notation is powerful because it contains both the domain and the range. For example we might write $f(2)$, which shows that the domain value is $x = 2$, and that the range value (which we must calculate) is denoted $f(2)$.

Definition 1.1.3

The **Graph** of a function is

Example 1.1.1

Given the graph of the function $f(x) = \{(3, 4), (2, -1), (7, 8), (4, 2), (5, 4)\}$ determine:

- a) D_f
- b) R_f
- c) Is $f(x)$ a function?

Example 1.1.2

Consider the sketch of the graph of $g(x)$, and determine:

- a) D_g
- b) R_g
- c) Is $g(x)$ a function?

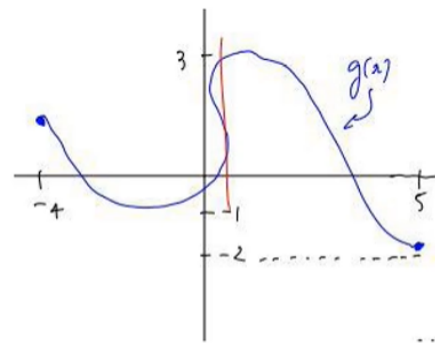


Figure 1.1.2

Note: In the above examples we have seen functions (and non-functions which we call relations) depicted graphically and numerically. We now turn to algebraic representations of functions. It is much more difficult to determine domain and range for functions given in an algebraic form, but the algebraic form is incredibly useful!

Example 1.1.3

State the domain and range of the functions given in algebraic form.

a) $f(x) = 3\cos(2x)$

b) $g(t) = (t - 2)^2 + 1$

c) $h(x) = \frac{2}{x-1}$

Notations for Domain and Range

Interval Notation

Set Notation

Pseudo-set Notation

Success Criteria

- I can use function notation to represent the values of a function
- I can apply the vertical line test
- I can identify the domain and range for different types of functions
- I can recognize and apply restrictions on the domain of functions