

Ch 5: Functions and Graphs

Goal: Function concept, graphs and notation



Motivating Example: Andy leaves his office in Padelford Hall on his way to teach in Kane Hall which is 2400 feet away.

Let $y = f(t)$ be Andy's distance from Padelford Hall in feet after t minutes.

Sketch a rough graph of each of the following functions...

- (a) Andy walks at a constant speed and get to Kane Hall in 10 minutes.
- (b) Andy walks at a constant speed for 5 minutes, gets halfway and is out of breath and stops for 2.5 minute, then decides to go back to his office walking twice as fast for 2.5 minutes.

Terminology

Definition: A **function** is a procedure for assigning a unique output for each allowable input. It has three parts:

1. $y = f(x)$ = 'a rule' (a table, graph, expression or description)
2. **Domain:** A set of allowable inputs.
3. **Range:** A set of outputs.

Example: Sketch a graph and give domain range

- $h(t)$ = "height as a function of age"

- $g(x)$ = "value of y in terms of x in the graph"



- $p(w)$ = "price to send a package as a function of weight" (table given below)

1 oz	\$1.69
2 oz	\$1.69
3 oz	\$1.69
4 oz	\$1.86
5 oz	\$2.04
6 oz	\$2.21

Functions from mathematical expressions

Example:

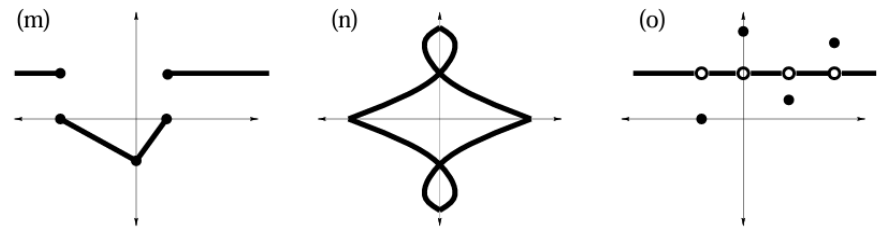
Sketch and give the domain and range of

$$w(x) = \sqrt{x - 2}$$

Note: In order to be a “function” it must have only one output for each allowable input to avoid ambiguity. Visually this means the graph passes the ***vertical line test***.

Examples from homework:

Are any of these functions?



Semicircles

The graph of all point satisfying the equation

$x^2 + y^2 = 9$ does not give a function!

Instead we say that this equation *implicitly* defines more than one function.

Functional Notation:

Example: $f(x) = 4 - x^2$

Compute or simplify the following...

(a) $f(0)$, $f(1)$, and $f(2)$

(b) $2f(0) - 3f(1) + 7$

(c) $f(2t) + 3f(w)$

(d) $f(x + h)$

(e) $\frac{f(x+h)-f(x)}{h}$ (completely simplify!)

Try Again

Example: $g(x) = 2x^2 - 3x$

$$\frac{g(x+h) - g(x)}{h} = ?$$

Example: $w(x) = \sqrt{x-3}$ (*challenge*)

$$\frac{w(x+h) - w(x)}{h} = ?$$