

# **ANALYSIS BASICS**

## **Function**

### ***Definition***

Given two sets  $A$  and  $B$ , a function from  $A$  to  $B$  is a rule or mapping that takes each element  $x \in A$  and associates with it a single element of  $B$ . We write  $f : A \rightarrow B$ . Given an element  $x \in A$ , the expression  $f(x)$  is used to represent the element of  $B$  associated with  $x$  by  $f$ .

The set  $A$  is called the domain of  $f$ .

The range of  $f$  is not necessarily equal to  $B$  but refers to the subset of  $B$  given by  $\{y \in B : y = f(x) \text{ for some } x \in A\}$ .

## **Dirichlet function**

The Dirichlet function is defined as:

$$f(x) = \begin{cases} 1 & \text{if } x \in \mathbb{Q} \\ 0 & \text{if } x \notin \mathbb{Q} \end{cases}$$

The domain is  $\mathbb{R}$ .

## **Absolute value function**

The absolute value function is defined as:

$$f(x) = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x \leq 0 \end{cases}$$

The domain is  $\mathbb{R}$ .