

Mathematical Notations

Numbers:

- $\mathbb{R}$: The set of real numbers
- $\mathbb{R}^n$: n -tuples of real numbers
- $\mathbb{Q}$: Rational numbers
- $\mathbb{C}$: Complex numbers $x + iy$ where $i^2 = -1$
- $\mathbb{N}$: Natural numbers $\{1, 2, 3, \dots\}$
- $\mathbb{Z}$: Integers $\{\dots, -2, -1, 0, 1, 2, \dots\}$

Sets:

- $x \in X$: x is an element in the set X
- $S \subset X$: S is a subset of X
- $S \subsetneq X$: S is a subset of X but not equals to X
- $X \times Y$: Cartesian product, the set of pairs $\{(x, y) : x \in X, y \in Y\}$
- $|S|$: Cardinality (size) of the set S
- ϕ : Empty set
- $V \longrightarrow W$: A map from V to W
- $x \mapsto y$: A map sending x to y , (“ x maps to y ”)

Logical symbols:

- $\forall$: “For every”
- $\exists$: “There exists”
- $\exists!$: “There exists unique”
- $:=$: “is defined as”
- $\implies$: “implies”
- $\iff$ or iff : “if and only if”. A iff B means
 - if: $B \implies A$
 - only if: $A \implies B$
- Contrapositive: $A \implies B$ is equivalent to $\text{Not}(B) \implies \text{Not}(A)$