

Vector Calculus

Logic and Set Summary

Dr. Paul L. Bailey
September 4, 2017

Logic Notation Summary

Symbol	Abbrev	Name	Format
\neg	NOT	Negation	$\neg p$
\wedge	AND	Conjunction	$p \wedge q$
\vee	OR	Disjunction	$p \vee q$
\Rightarrow	IMP	Implication	$p \Rightarrow q$
\Leftrightarrow	IFF	Equivalence	$p \Leftrightarrow q$
\Uparrow	XOR	Exclusion	$p \Uparrow q$
\Downarrow	NOR	Alternate Denial	$p \Downarrow q$
\Uparrow	NAND	Joint Denial	$p \Uparrow q$

Table 1: Logical Operators

p	q	$\neg p$	$p \wedge q$	$p \vee q$	$p \Rightarrow q$	$p \Leftrightarrow q$	$p \Uparrow q$	$p \Downarrow q$	$p \Uparrow q$
T	T	F	T	T	T	T	F	F	F
T	F	F	F	T	F	F	T	F	T
F	T	T	F	T	T	F	T	F	T
F	F	T	F	F	T	T	F	T	T

Table 2: Truth Tables

Precedence of Operators

1. NOT
2. AND, OR
3. XOR, NOR, NAND
4. IMP
5. IFF

Symbol	Abbrev	Meaning
\forall	FORALL	for every (for all)
\exists	EXISTS	there exists (for some)
$\exists!$	UNIQUE	there exists uniquely
\ni	ST	such that

Table 3: Quantifiers

Set Notation Summary

Symbol	Meaning	Definition
\in	is an element of	Example: $\pi \in \mathbb{R}$
\notin	is not an element of	Example: $\pi \notin \mathbb{Q}$
\subset	is a subset of	$A \subset B \Leftrightarrow (a \in A \Rightarrow a \in B)$
\cap	intersection	$A \cap B = \{x \mid x \in A \text{ and } x \in B\}$
\cup	union	$A \cup B = \{x \mid x \in A \text{ or } x \in B\}$
\setminus	complement	$A \setminus B = \{x \mid x \in A \text{ and } x \notin B\}$
\times	cartesian product	$A \times B = \{(a, b) \mid a \in A \text{ and } b \in B\}$

Table 4: Set Operations

Set	Name	Definition
\mathbb{N}	Natural Numbers	$\{1, 2, 3, \dots\}$
\mathbb{Z}	Integers	$\{\dots, -2, -1, 0, 1, 2, \dots\}$
\mathbb{Q}	Rational Numbers	$\{p/q \mid p, q \in \mathbb{Z}\}$
\mathbb{R}	Real Numbers	$\{\text{“Dedekind Cuts”}\}$
\mathbb{C}	Complex Numbers	$\{a + ib \mid a, b \in \mathbb{R} \text{ and } i^2 = -1\}$
\mathbb{R}^2	Euclidean Plane	$\{(a, b) \mid a, b \in \mathbb{R}\}$
\mathbb{R}^3	Euclidean Space	$\{(a, b, c) \mid a, b, c \in \mathbb{R}\}$

Table 5: Standard Sets