Introduction to Analysis Notes

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1 Sets and Lists

Definition 1.1. A set is an unordered group of distinct elements.

Definition 1.2. The empty set (denoted $\varnothing$) is the unique set having no elements.

While sets are unordered groups of distinct elements, lists (also called n-tuples) are ordered groups of elements which are not necessarily distinct. An ordered pair (a, b) is a list of a length two (a tuple), where a, and b are elements of some set.

Definition 1.3. An ordered pair (a, b) is a tuple of elements of some set.

Ordered pairs (and n-tuples more generally) can be represented as sets themselves - the pair (a, b) can be represented as the set $\{a, \{a, b\}\}$.

Definition 1.4. The Cartesian product of two sets A and B is denoted $A \times B$. It is equal to $\{(a, b) \mid a \in A, b \in B\}$.

2 Boolean Algebra

Boolean algebra is the algebra dealing exclusively with the values *true* and *false*.

The primary operations of Boolean algebra are *negation* (also called *not*) denoted by $\neg$, *conjunction* (also called *and*) denoted by $\wedge$, and *disjunction* (also called *or*) denoted by $\vee$.

Since Boolean algebra has only two elements, it is possible to enumerate all variable combinations for a function. This is often done in the form of a truth table — a table listing the values of variables and the corresponding function value as rows. For example, Table 1 gives a combined truth table for negation, conjunction, and disjunction. It also serves as the definition of these operations.

Table 1: Truth table of primary operations

X	Y	$\neg X$	$X \wedge Y$	$X \vee Y$
True	True	False	True	True
True	False	False	False	True
False	True	True	False	True
False	False	True	False	False