

Set Theory

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Chapter 1

Axioms and Operations

1.1 Basic Axioms

Axiom 1.1 (Axiom of Extensionality). For any sets x and y , if for any set z , we have $z \in x$ if and only if $z \in y$, then we say that x and y are **equal**, denoted $x = y$.

Axiom 1.2 (Axiom of Empty Set). There is a set x such that $y \notin x$ for each set y . The set x is called the **empty set** and is denoted by \emptyset .

Axiom 1.3 (Axiom of Pairing). For any sets x and y , there is a set w such that for each set $z \in w$, either $z = x$ or $z = y$ holds. The set w is called the **pair set** of x and y and is denoted by $\{x, y\}$. If $x = y$, then we write $\{x\}$ for short.

Axiom 1.4 (Axiom of Power Set). For any set x , there exists a set y such that for any set z , $z \in y$ if and only if $z \subseteq x$. The set y is called the **power set** of x and is denoted by $\mathcal{P}(x)$.