Sets Overview & Operations

Here are some important terms and definitions related to sets from the document:

1. **Set**: A well-defined collection of objects. For example, the set of all natural numbers, $N = \{1, 2, 3, \ldots\}$.
2. **Element (or Member)**: An object contained within a set. Denoted by the symbol $\in$. For instance, if a is an element of set A, we write $a \in A$.
3. **Empty Set**: A set with no elements, denoted by $\emptyset$ or $\{\}$.
4. **Finite Set**: A set with a countable number of elements. For example, the set of vowels in the English alphabet, $\{a, e, i, o, u\}$.
5. **Infinite Set**: A set with an uncountable number of elements, such as the set of all natural numbers, $N = \{1, 2, 3, \ldots\}$.
6. **Subset**: A set A is a subset of a set B if every element of A is also an element of B. Denoted by $A \subseteq B$.
7. **Proper Subset**: A set A is a proper subset of B if $A \subseteq B$ and $A \neq B$. Denoted by $A \subset B$.
8. **Power Set**: The set of all subsets of a set A, including A and the empty set. Denoted by $P(A)$. For example, if $A = \{1, 2\}$, then $P(A) = \{\emptyset, \{1\}, \{2\}, \{1, 2\}\}$.
9. **Universal Set**: The set that contains all the objects under consideration, usually denoted by U .
10. **Union**: The set of all elements that are in either set A or set B or in both. Denoted by $A \cup B$. For example, if $A = \{1, 2, 3\}$ and $B = \{3, 4, 5\}$, then $A \cup B = \{1, 2, 3, 4, 5\}$.
11. **Intersection**: The set of all elements that are in both sets A and B. Denoted by $A \cap B$. For example, if $A = \{1, 2, 3\}$ and $B = \{2, 3, 4\}$, then $A \cap B = \{2, 3\}$.
12. **Difference**: The set of all elements that are in set A but not in set B. Denoted by $A - B$ or $A \setminus B$. For example, if $A = \{1, 2, 3\}$ and $B = \{2, 3, 4\}$, then $A - B = \{1\}$.
13. **Complement**: The set of all elements in the universal set U that are not in set A. Denoted by A' or $\overline{A}$.
14. **Venn Diagram**: A diagram that shows all possible logical relations between a finite collection of sets. Used to illustrate set operations like union, intersection, and difference .
15. **Disjoint Sets**: Two sets A and B are disjoint if they have no elements in common, i.e., $A \cap B = \emptyset$.

16. **Equal Sets**: Two sets A and B are equal if they contain exactly the same elements, i.e., $A = B$ if $A \subseteq B$ and $B \subseteq A$.

These definitions provide a foundational understanding of sets and their properties, which are crucial for studying more advanced mathematical concepts .