Proposition: For all integers $a$, $\exists$ an integer $b$ such that $a + b = 0$.

Proposition: For all $a \in \mathbb{Q}$ where $a \neq 0$, $\exists b \in \mathbb{Q}$ such that $ab = 1$.

Definition: A set is a collection of unordered distinct objects, called elements.

Definition: The empty set, denoted $\emptyset$ or $\{\}$, is the set with no elements.

Definition: The cardinality of a set $A$, denoted $|A|$, is

1. the number of elements of $A$ for finite sets
2. infinite for infinite sets.

Set properties:

- The empty set is always a subset of any set.
- The number of subsets of a set with $n$ elements is $2^n$.

Set operation definitions:

- $A \cup B := \{x| x \in A \text{ or } x \in B\}$
- $A \cap B := \{x| x \in A \text{ and } x \in B\}$
- $A \setminus B := \{x| x \in A \text{ and } x \notin B\}$
- $A^c := \{x| x \notin A\}$  
  This is only well-defined with respect to a universal set $U$.

Set Element Method: Prove $A \subseteq B$ and $B \subseteq A$ to conclude that $A = B$.

Proposition: $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$. 