Notations

1. R: The set of all real numbers;
2. Q: The set of all rational numbers; a positive number in Q is represented by $\frac{p}{q}$ where p and q are two integers such that they have no common factor except 1.
3. $Left := Right$: $Left$ is defined by $Right$;
4. $Left =: Right$: $Right$ is defined by $Left$;
5. $\{x; conditions\}$: a set that contains all elements that meet the specified conditions, examples include

$$(a, b) := \{x; a < x < b\}, \quad [a, b] := \{x, a \leq x \leq b\},$$

$$[a, b) := \{x; a \leq x < b\}, \quad (a, b] := \{x, a < x \leq b\},$$

$$\{a_n; n \geq 1\} := \{a_1, a_2, a_3, \dots\};$$

   (a, b) is called an open interval and $[a, b]$ is closed interval. $[a, b)$ and $(a, b]$ are called half intervals;
6. $x \in A$: x is in A;
7. $\forall x \in A$: For any x in A;
8. $\exists s$: There exists an s. For example, $\exists s \in A$ is equivalent to "there exists a s in A."
9. $A \subset B$: the set A is contained in the set B;