Common Symbols and Notations

Before you begin algebra in college or if you have already taken it, make sure you are familiar with basic notations, rules, properties, axioms, definitions, ..., and theorems. The prerequisite section of a precalculus or algebra textbook is probably the most overlooked yet most important part of any math book. It is like the foundation of a house. We will begin with some basic notations to clear up confusion.

Number Sets

Complex Number	Real Number	Rational Number	Integer Number
$\mathbb{C} = \mathcal{C} = C = \mathrm{C} = \cdots$	$\mathbb{R} = \mathcal{R} = R$	$\mathbb{Q} = \mathcal{Q} = Q$	$\mathbb{Z} = \mathcal{Z} = Z$
$\{a + bi \mid a, b \in \mathbb{R}\}$	$x \in (-\infty, \infty)$	$\left\{\frac{a}{b} \middle\| b \neq 0, a, b \in \mathbb{R}\right\}$	$\{\ldots, -2, -1, 0, 1, 2, \ldots\}$

Irrational numbers such as π and e or $\sqrt{2}$ are written as all rational numbers removed from the real number set. I.e., $\mathbb{I} = \mathbb{R} \setminus \mathbb{Q}$ (sometimes I is the set of integers). That is, the rational numbers are removed from the real number set, leaving only irrational numbers.

The Natural Numbers, $\mathbb{N} = \{1,2,3, \ldots\}$ and the positive integer set is, $\mathbb{Z}^+ = \{1,2,3, \ldots\}$.

The natural numbers or positive integers with zero would be $\mathbb{Z}^+ \cup \{0\} = \{1,2,3, \ldots\} \cup \{0\}$.

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Implication symbol, \Rightarrow	$\Rightarrow$	$a + b = 0 \Rightarrow b = -a$
In (element of), \in	$\in$	$1 \in \{1,2\}$
Proper subset (contained in), \subseteq	$\subseteq$	$\{1\} \subseteq \{1,2\}$
Subset, \subset	$\subset$	$\{1,2\} \subset \{1,2\}$
For all, \forall	$\forall$	$\forall_x \in [1,2]$
If and only if (iff), \Leftrightarrow	$\Leftrightarrow$	$p \Rightarrow q \Leftrightarrow q \Rightarrow p$
Such that, \ni	$\ni$	
There exists, \exists	$\exists$	
Therefore, \therefore	$\therefore$	
Because, \because	$\because$	
Equivalent, \equiv	$\equiv$	$\mathbf{x} \equiv \vec{x}$
Goes to, \to	$\to$	$x \to a$ as $f(a) \to L$
Union, \cup	$\cup$	$\{a\} \cup \{b\} = \{a, b\}$
Intersection, \cap	$\cap$	$\{a, b\} \cap \{b, c\} = \{b\}$

The above symbols are quantifiers of sorts to condense English. There are very formal ways of using them and informal ways. Mathematicians are trained during their junior/senior years to use them formally; in the same way an English professor learns the structure of language. Physicists and engineers usually use them informally—slang. There is a place for formality and a place for slang use. You will learn as you progress.