

LaTeX Examples

Special symbols and how to make them:

You write	L ^A T _E X	Remark
<code>\nat</code>	\mathbb{N}	in or out of math mode
<code>\real</code>	\mathbb{R}	in or out of math mode
<code>\integer</code>	\mathbb{Z}	in or out of math mode
<code>\rational</code>	\mathbb{Q}	in or out of math mode
<code>\comp{A}</code>	A^c	only in math mode
<code>\power{A}</code>	$\mathcal{P}(A)$	only in math mode
<code>\forward</code>	\implies	not in math mode
<code>\back</code>	\impliedby	not in math mode

Some more examples:

1. Let A and B be sets. Then $A \cup B$ is the union of the sets A and B , $A \cap B$ is their intersection. The set $A \setminus B$ is the set of all elements that are in A but not in B .
2. If we want to talk about many sets at once, we introduce the idea of an arbitrary indexing set. Then we can talk about the collection $\{U_\alpha\}_{\alpha \in \Lambda}$. Once we have this notation, we can discuss unions and intersections of arbitrary collections very easily.

$$x \in \bigcap_{\alpha \in \Lambda} U_\alpha \text{ means that } \forall \alpha \in \Lambda, x \in U_\alpha.$$

$$x \in \bigcup_{\alpha \in \Lambda} U_\alpha \text{ means that } \exists \alpha \in \Lambda \text{ such that } x \in U_\alpha.$$

3. Suppose that X and U are sets with $X \subseteq U$. Then $X \setminus U = \emptyset$ if and only if $X = U$.
4. We can also define piecewise-defined functions in the standard way:

$$f(x) = \begin{cases} x^2 & \text{if } x < -2 \\ -2x & \text{if } -2 \leq x < 1 \\ -2 & \text{if } x \geq 1 \end{cases}$$

5. Here's the way to typeset a multi-line computation:

$$\begin{aligned}\frac{(ab)^{-x}}{a^{-x} + b^{-x}} &= \frac{\frac{1}{(ab)^x}}{\frac{1}{a^x} + \frac{1}{b^x}} \\ &= \frac{\frac{1}{a^x b^x}}{\frac{1}{a^x} + \frac{1}{b^x}} \\ &= \frac{1}{b^x + a^x}.\end{aligned}$$

Here's a theorem and its proof.

Theorem 2.4: If $A \subseteq B$ and $B \cap C = \emptyset$, then $A \cap C = \emptyset$.

Proof: Suppose that $A \cap C \neq \emptyset$. Then we know that there exists $x \in A \cap C$. That is, $x \in A$, and $x \in C$. We have two possible cases:

case i. $x \in B$. It follows that $x \in B \cap C$. So $B \cap C \neq \emptyset$.

case ii. $x \notin B$. Then A cannot be a subset of B since there is an element of A that is not in B .

Thus either $A \not\subseteq B$ or $B \cap C \neq \emptyset$. The theorem follows by contraposition. ■

Problem and Theorem Environments: You saw above how to implement the Theorem environment. The problem environment is almost the same. These environments are used to state and reference the problem to be solved or the theorem to be proved. The main difference you need to be aware of in calling these is that the Theorem environment has *one* required input and the Problem environment has *two*. This is because theorems require only a single reference (e.g. 3.4.12), whereas problems require two: the problem number and the chapter number. We say "Theorem 3.4.12," whereas we say "Problem 4 in Chapter 3."

Implementing the Problem Environment: Notice the two required arguments. The first is the problem number and the second is the chapter number.

Problem 1 in Chapter 3: Is there a distinction between \emptyset and $\{\emptyset\}$?