

Getting Started with LaTeX

Henry Towsner

January 18, 2020

1 Introduction

LaTeX is the standard piece of software used for typesetting mathematics. It's also used in related fields, with popularity basically proportional to how close the subject is to math. For instance, it's very common in physics and computer science, used but less common in biology, and very rare in most of the humanities.

LaTeX works a bit differently from a word processor like Microsoft Word. Your document is a text file which will have a “.tex” suffix. This is essentially the source code for generating your document, writing in a programming language. The LaTeX program compiles the source code into a document, usually a PDF file. The power—and difficulty—of working with LaTeX comes from the separation of these two steps: first you write your text, and then you run a program to generate a version that looks the way you want.

LaTeX is a very powerful and complicated piece of software, and you'll learn it the same way everyone does: starting simple with a lot of copying and pasting, and learning tricks one by one as you need them.

2 Software Installation

- There are free online programs for working with LaTeX; overleaf.com seems to be the best of them.
- For Windows, you can download and install the software at <http://www.tug.org/texlive/>.
- For Macs, you can download and install the software at <http://www.tug.org/mactex/>.
- If you're using a (non-Mac) Unix variant of some kind, you can get the software at <http://www.tug.org/texlive/>. However on most Linux distributions you can install a package with a name like “texlive-latex-base” (or something similar) and its dependencies.

3 Getting Started

You can write your .tex as a text file in any editor you like. (If you're using a word processor rather than a text editor, make make sure that you're saving as raw text: word processors default to saving files in their own formats, which will confuse the L^AT_EX program.)

There are also programs that are designed specifically for writing L^AT_EX. Some of them provide some guidance for writing the file (like buttons you can press to add certain bits of code), and most of them integrate with the L^AT_EX program so that you can compile your file with a button press rather than writing a separate program. Some of these may have been included if you installed T_EX Live or MacT_EX, or can be downloaded from the same place.

To make sure you have everything working, you should make sure you can compile the source code for this file and generate the PDF yourself.

4 The Structure of Documents

You can go ahead and start with a copy of this file and use it as a basis for your own documents: delete everything between “`\begin{document}`” and “`\end{document}`” and replace it with your own content. The best way to get used to working in L^AT_EX is to just start trying things out and figuring out which commands give you which sorts of outputs. The stuff before

As you've probably noticed, a L^AT_EX file consists mostly of ordinary text, which shows up as is in the output, formatted nicely. Commands begin with the backslash, `\`. (Note that this means that, in order to type a backslash, you have to use a command `\textbackslash`. If you just type a backslash by itself, you'll probably get an error when you try to compile.)

Other than text, the most important thing you need is “math mode”, which is used for typesetting math. There are two versions. *Inline math mode* is used for putting math in the middle of a line of text, like $x + y = z$. The math is put between dollar signs, `$`.

Display math mode is when you have a whole line of text, like

$$x + y = z.$$

The displayed math begins with `\[` and ends with `\]`. Usually good practice is to put short bits of math inline, and long things in a displayed line.

Inside math mode, you can easily do superscripts, x^y (with `^`, that is, shift-6), subscripts x_y (with `_`, the underscore). If you want to put more than one symbol in the superscript or subscript, you need to enclose it in braces, `{` and `}`, like x^{4y} , x^{4^y} , and y_{3x^2+7} .

You can also display fractions nicely: $\frac{x+y+z}{x-y+z}$.

There are also lots of mathematical symbols that can be inserted in math mode, like \int , \leq , \geq , \dots , \in , \sqrt{x} , $\sqrt[3]{x}$, and \mathbb{R} . There's a huge list of symbols that are available, either directly in L^AT_EX or by including *packages* which expand what L^AT_EX can do. (For example, I've included the package `amssymb`, which is

a very common package providing a lot of additional math symbols, including \mathbb{R} .) Detexify, at <http://detexify.kirelabs.org/classify.html>, is a website where you can draw the symbol you want and it will make its best guess at the command for making it.

One thing to watch out for is that L^AT_EX doesn't interpret whitespace, like spaces and new lines, literally. To separate paragraphs, you need a *blank line* between them: if you just write some text, hit return, and write more text, L^AT_EX will put them on the same paragraph.

5 Dealing with Errors

Just like with any other programming language, sometimes you'll make mistakes in your code. You should always make sure to proofread the compiled file to make sure things typeset correctly. For instance, a common mistake is to forget to enclose long superscripts, so that you write $x^2 + 3$ when you mean x^{2+3} .

It's also easy to make mistakes which cause your code to have invalid syntax, in which case L^AT_EX will give you an error. It should give you an error message, which may or may not be helpful in finding the problem. It can help to "comment out" lines: adding the % symbol somewhere in a line will cause L^AT_EX to ignore everything in that line. If you put that at the start of a line and the error goes away, you've found the source of the problem.

The most common mistakes you might make are:

- misspelling a command,
- forgetting that symbols like \$, %, {, \ are special symbols and that if you want to actually *display*, for example, a dollar sign, you need to use the command $\backslash\$$, because a dollar sign by itself means "start math mode",
- forgetting a closing brace }.

6 Other Tricks

There's a *huge* amount more L^AT_EX can do. There's a very good user community online, so often searching the web for how to do something or looking for ideas at tex.stackexchange.org will get you some code that you can copy and play around with to do what you want.

The next thing you might find useful is "aligned equalities", where you have a sequence of equalities aligned neatly, like:

$$\begin{aligned}x &= x + (y - y) \\ &= (x + y) - y\end{aligned}$$

Getting Started with L^AT_EX, <http://www.maths.tcd.ie/~dwilkins/LaTeXPrimer/> discusses a lot of other features you might find useful.