A Gentle Introduction to LaTeX

DeVon Herr

January 2019

Before getting into LaTeX, it may be worthwhile to seriously consider reasons for using it.

Unlike Microsoft Word and Google Docs', LaTeXis not what is known as a WYSIWYG ("What You See Is What You Get") editor; when one does word processing in a WYSIWYG editor, where the document will literally look like what is being typed. LaTeX, however, is closer to a programming language; it takes the text and commands put in and produces a document.

The advantage to using LaTeXversus it's alternatives is the degree of control it provides. Many can relate to the situation in Microsoft Word where one shifts an image half an inch in some direction and the entire document explodes. This does not happen in LaTeX; LaTeX will do exactly what you tell it to do, with no ambiguity. On a more surface level, documents created by LaTeXhave a certain professional aesthetic, similar to research papers and some textbooks. Of course, this is because numerous research papers and textbooks are written using LaTeX.

The biggest advantage, however, is LaTeX's ability to handle mathematical expressions. There is a certain cleanliness and crispness to an expression such as x^2 or

$$\iint_S \vec{F} \cdot \, d\sigma = \iint_R \vec{F}\left(r(u,v)\right) \cdot \, \left|r_u \times r_v\right| \, dA$$

when prepared in LaTeX. And unlike the equation editor in Google Docs', one doesn't have to go into a menu for the integral symbol or to create a fraction, one can simply type the command for it into LaTeX.

As a result, there's a certain efficiency in LaTeX, but also in document formatting as well. Instead of needlessly pressing the tab key to properly shift text right like this, there's a command for that.

Contents

1 Opening the Document and Editor

Technically speaking, you *can* write the code for a LaTeXdocument in notepad and export the .txt file into a LaTeXcompiler, this is incredibly inefficient and absolutely not something you should do. Most people download editors for themselves, but unless you plan on regularly using it offline, an online editor works just fine. I highly recommend using Overleaf. Set up an account by the "Register" button on the top right. Once you have logged in, create a new document by hitting the "New Project" on the top left.

I highly recommend using the "Example Project" and just messing around with the editor. Due to how LaTeX works, you'll have to hit the "Recompile Button" on the top side of the screen to see your updated document. If you click on the drop-down arrow, you can turn "Auto-Compile" on, which will do the compiling for you every few seconds you spend editing.

But onto the real meat. I will be proceeding from a blank document.

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{An Gentle Introduction to \LaTeX}
\author{DeVon Herr}
\date{January 2019}

\begin{document}

\maketitle

Before getting into \LaTeX,

...

\end{document}
```

You can ignore the first two lines (the "\documentclass" and "\usepackage" commands). They just set up some basic settings that you don't need to worry about.

The \title, \author, and \date commands are fairly straight forward. Inside their braces, { and }, you encode some basic information about your document that can be displayed by the "maketitle" command.

The document formally starts after the "begin{document}" command and ends at the "end{document}" command. Anything you intend to be seen needs to between them.

2 Spacing

Due to some peculiarities of how LaTeX works, you need to have an entire empty line between two paragraphs to actually have a line break. For instance, the following code

```
Yo, Big Shaq, the one and only.
Man's not hot, never hot.
```

would be rendered as

> Yo, Big Shaq, the one and only. Man's not hot, never hot.

a single line.

To get the line break, the code would be

```
Yo, Big Shaq, the one and only.

Man's not hot, never hot.
```

which would be rendered as

> Yo, Big Shaq, the one and only.
> Man's not hot, never hot.

2.1 Sections and Subsections

On the standard blank or example document on Overleaf, you are armed with three "layers" of sections. They are sections, subsections, and subsubsections. For instance,

```
\subsection{Example Subsection}
```

creates

2.2 Example Subsection

Most of the time, you shouldn't resort past subsections. If there is so much detail that a subsubsection is necessary, reconsider what you're actually putting into your document.

3 Text Formatting

You can **bold** *italicize* or underline your text. The code is as follows.

```
You can \textbf{bold}
\textit{italicize} or
\underline{underline} your text.
```

Note that underlined text has an issue where it can trail into the margin. There are solutions for this, but it's simpler to just avoiding it.

While not exclusive to LaTeX, **bold** text is far easier to the eye to see, use bold to highlight important information. *Italics*, while noticeable when reading line-by-line, is not easily seen when quickly scanning a document; use it for a smaller emphasis.

We will discuss text color later, as it is not built in.

4 The Math Environment

To get a mathematical expression, use dollar signs. For instance, x^2 is given by

```
$x^2$
```

Be careful, and put only math in. *textdoesn'tproperlyrender*, as you can see there.

4.1 Various Useful Operators

For what it's worth, so long as you're sufficiently descriptive, the majority of these can be Google'd. I have here some of the most common ones I use.

Symbol	Command
$\cdot$ (the implicit multiplication symbol)	\cdot
$\times$	\times
$\rightarrow$	\rightarrow
$\int$	\int
θ	\theta

For more involved expressions, where a bunch of stuff is being modified or where multiple expressions are involved such as x^{abc}, one has to use curly braces. The following expression would be written as

```
x^{abc}
```

Expression	Command
x^{ab}	\x ^ {ab}
$\sqrt{x}$	\sqrt{x}
$\sqrt[n]{x}$	\sqrt [n]{x}
$\frac{a}{b}$	\frac{a}{b}
$\int_a^b$	\int_{a}^{b}
x_{ab}	\x_{ab}

4.2 The Display Math Environment

Sometimes you want a mathematical expression to be on it's own line. Use this at your own discretion; I generally use this when the equation itself is particularly

important, or would physically write it out in a conversation. On the contrary, I would keep it with text if it was something I would just point to.

There's an easy way, but if you plan on going into any kind of field where you publish papers, the easy way is almost fundamentally wrong.

In the beginning of your code, *before* you have the \begin{document}, add this on its own line:

```
\usepackage{amsmath}
```

The beginning of your code may now look like this:

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\usepackage{amsmath}

\title{Man's Not Hot}
...
```

Now, to put a mathematical expression on its own line, write the expression between a \[and a \].

$$\frac{d}{dx} x^{n} = \frac{1}{n+1} x^{n+1} + C$$

is given by

```
\[\frac{d}{dx} x^{n} = \frac{1}{n+1} x^{n+1} + C\]
```

4.3 Alignment

Sometimes you may want equations to be aligned by some common symbol. Instead of using \[and \], we will use a more complicated structure, namely \begin{align*} and \end{align*}. After each line, add \\two backslashes. Before the aligned element, add an ampersand &.

This is a mouthful without an example. The following

$$\begin{aligned} 2 + 2 &= 4 \\ 4 - 1 &= 3 \\ x &= y + z \end{aligned}$$

is given by

```
\begin{align*}
2 + 2 &= 4 \\
4 - 1 &= 3 \\
x &= y + z
\end{align*}
```

5 Other Environments

For instances where we would like the text format to be changed to fit some rules, we have environments. For instance, if we would like our text bulleted' and indented, we have an option for that, the itemize environment..

For instance,

- Everyday man's on the block
- Smoke trees

is given by

```
\begin{itemize}
    \item Everyday man's on the block
    \item Smoke trees
\end{itemize}
```

Note that each line is preceded by the term \item.

For numbered lists, we have the enumerate environment, which follows the same rules. For instance,

1. Hop out the 4-door with the .44 it was 1-2-3 and 4.
2. Chilling in the corridor
3. Your dad is 44.
4. And he's still calling man for a draw.
5. Let him know, when I see him, I'm gonna spin his jaw.

is given by

```
\begin{enumerate}
    \item Hop out the 4-door with the .44 it was 1-2-3 and 4.
    \item Chilling in the corridor
    \item Your dad is 44.
    \item And he's still calling man for a draw.
    \item Let him know, when I see him, I'm gonna spin his jaw.
\end{enumerate}
```