

# Getting Started with LaTeX

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LaTeX is a professional typesetting system, specifically designed for typesetting mathematics (but useful for typesetting any kind of document). It will take a little work to get the hang of it, but once you get used to it you will find that the results are far superior to whatever word processing software you are in the habit of using.

The goal of this document (which is itself typeset in LaTeX) is to get you started and on the right track; once that's been accomplished I will point you to the standard “not so short” tutorial.

## 1 LaTeX Online

Although it pains me somewhat to say it, the easiest way to get started is probably via the online LaTeX compiler available at <https://www.overleaf.com/> (I will describe other options in the next section, below). Sign up for a *free* account (do *not* send them any money – the paid accounts are for collaborating on documents, which would constitute cheating in this class). Once you have an account you can use their system to create a new file and then proceed as described in the “Getting Started” section below. (If instead you start a new “project” as a “blank” document, they include a framework that has some extraneous nonsense that I object to but doesn't really hurt anything – feel free to leave it or remove it, as you see fit.)

## 2 Installation

If you prefer to download and install LaTeX on your computer, there are a number of different “distributions” that are available for free. Which you

choose is mostly a matter of what operating system you use:

**Linux:** Use your system’s package manager to install *TeXLive*.

**MacOSX:** Install *MacTeX* from <http://www.tug.org/mactex/>. MacTeX is TeXLive repackaged for MacOSX.

**Windows:** There are a number of choices. I have used both *MikTeX* (<http://miktex.org>), which is specifically for Windows, and *TeXLive* for Windows: <http://www.tug.org/texlive/>. There is also *ProTeXt* (<http://www.tug.org/protext/>), which is MikTeX repackaged with some other goodies.

You might want to install the software on campus to take advantage of the relatively high speed internet service – the downloads tend to be large.

MikTeX has been installed on the computers in Sullivan room 138, so another option – at least to get you going – is to do your work there.

### 3 Getting Started

`latex` (or in our case `pdflatex`) is a program that takes as input a file of specially formatted text and produces as output a `.pdf` file. To construct the input file you will need a “text editor,” which is a program that allows you to create a simple, unformatted text file – in particular, *not* a word processor. Familiar examples are `notepad` on Windows, `TextEdit` on MacOSX, `vi` and `emacs` (among many others) on Linux. Both *TeXLive* and *MikTeX* include the *TeXworks editor*, which functions as both a text editor and `.pdf` file viewer (with bells and whistles like built in syntax checking and a simple button for running `latex` or `pdflatex`); this is a good choice if you’re not already emotionally attached to something else. *Overleaf* has its own built in text editor; it will be obvious. . . In any case, find a text editor you can get comfortable with, open a new file, and type (or cut and paste) the following:

```
\documentclass{article}

\begin{document}
Hey, how’s it going?
\end{document}
```

Once you're done, save the file as `example.tex` (the `.tex` suffix identifies the file as a LaTeX source file).

This is as simple a LaTeX file as you're going to see. Each LaTeX command begins with a “\”; the `\documentclass` command tells LaTeX what kind of document you're working on (other possibilities include `book`, `report`, and `slides`; `article` is a good choice until you become an expert). The body of the document is sandwiched between the `\begin{document}` and `\end{document}` statements.

The next step is to run the `pdflatex` program, passing in the `example.tex` file as an argument (`pdflatex` creates a `.pdf` file from your LaTeX source; the older `latex` command, which you certainly have on your system as well, creates a `.dvi` file, which is less standard). In *Overleaf* hit “recompile;” if you are using *TeXworks*, click on the green circle with the “play” triangle in it. Otherwise open a terminal window (or “command prompt” or whatever they call it in your operating system), navigate to where your file is, and type

```
pdflatex example
```

The result should be the creation of a file `example.pdf`, whose content looks something like:

```
Hey, how's it going?
```

Which is perhaps not too impressive, but we have verified that you can use the system, and we can now get fancier.

## 4 A Little More

We proceed with a small barrage of random notes, followed by a more interesting example. The notes:

- The `\documentclass` command (which was the first command in our example) accepts some optional arguments. In particular, it's useful to specify that the paper is standard American  $8.5 \times 11$ , and something reasonable for the font size. Try

```
\documentclass[letterpaper,12pt]{article}
```

instead of `\documentclass{article}`.

- A blank line starts a new paragraph.
- With the exception of a blank line, LaTeX ignores whitespace. So

```
hello, world
```

and

```
hello,    world
```

and

```
hello,  
world
```

all generate the same output.

- A “%” can be used to add comments to your LaTeX source file – the remainder of the line after the % is ignored.

Okay, let's look at a more interesting example:

```

\documentclass[letterpaper,12pt]{article}

\begin{document}

% A brief treatise on the Quadratic Formula.

\begin{center}
\textbf{The Quadratic Formula}
\end{center}

\bigskip

By ‘‘completing the square’’ and using basic algebraic
techniques, it is easily seen that the solution to the
general quadratic
equation  $ax^2 + bx + c = 0$  is

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

provided  $a \neq 0$ .

This formula was known (in slightly altered form) to ancient
Babylonian mathematicians
as far back as 2000 B.C. % So says Wikipedia...
\end{document}

```

This produces:

### The Quadratic Formula

By ‘‘completing the square’’ and using basic algebraic techniques, it is easily seen that the solution to the general quadratic equation  $ax^2 + bx + c = 0$  is

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

provided  $a \neq 0$ .

This formula was known (in slightly altered form) to ancient Babylonian mathematicians as far back as 2000 B.C.

The example starts with the standard boilerplate:

```
\documentclass[letterpaper,12pt]{article}

\begin{document}
```

Followed by a comment, which you'll notice did not show up in the resulting document:

```
% A brief treatise on the Quadratic Formula.
```

We then center some boldface text,

```
\begin{center}
\textbf{The Quadratic Formula}
\end{center}
```

skip some space vertically,

```
\bigskip
```

and get right in to the text. Note that double quotes are done a little unusually – in particular, you don't want to use the double-quote key on your keyboard – each double-quote is two distinct characters, as below.

```
By ‘‘completing the square’’ and using basic
algebraic techniques, it is easily seen
that the solution to the general quadratic
```

Here comes the first math. We use the “\$” symbol to switch into “math mode” (and a second “\$” to switch back out). In math mode the “^” indicates a superscript, so  $x^2$  is “ $x^2$ ”. (LaTeX takes the very next symbol after the “^” as the superscript, so if you wanted “ $x^{19}$ ”, for example, you'd have to group the 1 and the 9 together like this:  $x^{\{19\}}$ .) The first math in our example is:

```
equation  $ax^2 + bx + c = 0$  is
```

Note that the math was in the middle of the sentence, and was included that way in the output. The second bit of math in our example is what's known as “displayed math.” Displayed math gets centered and has some space around it, and is not constrained to fit within the confines of a line of text. It starts and ends with “ $\$$ ”. In our example:

```
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
```

Here we have the very useful command `\frac`, which takes two arguments, the numerator and denominator, both enclosed in curly braces (so one half, for example, is `\frac{1}{2}`). The “plus or minus” symbol is produced by the command `\pm`, and the radical symbol by the `\sqrt` command. Notice that the `\pm` command doesn’t take any arguments – it just generates a “±” wherever you use it – whereas the `\sqrt` command does – it needs to know what to put under the radical.

The rest of our example is:

```
provided $a \neq 0$.
```

```
This formula was known (in slightly altered form) to  
ancient Babylonian mathematicians  
as far back as 2000 B.C. % So says Wikipedia...  
\end{document}
```

Observe that the blank line indicates the start of a new paragraph, and that the comment at the end of the last line of text is ignored by LaTeX. The last line is always `\end{document}`.

## 5 Next Steps

“The (Not So Short) LaTeX Tutorial” is excellent; you can find it at <http://www.ctan.org/tex-archive/info/lshort/english>; click on “lshort.pdf.” You don’t have to read the whole thing, but skimming it will make you aware of some of the things you can do. There is also a “wikibook” that is very good as a reference: <http://en.wikibooks.org/wiki/LaTeX/>.

Happy typesetting.