ASTR469: LaTeX (pronounced "La Tech")

LaTeXis a typesetting "language" that allows you to write and format documents in any way you like. There are tons of great online resources. I usually just google problems as they come up (obs).

You may be asking that since Microsoft Word exists, and is easy to use, why would anyone use LaTeX? There are a few main reasons:

- Professional output. Documents typeset with LaTeX look more professional and many of your textbooks were typeset with LaTeX for this reason.
- It's free! You can write LaTeX with any text editor, and the basic version of Overleaf is free as well.
- A document typeset with LaTeX will look the same on every machine (as long as LaTeX versions are the same).
- Writing mathematical expressions and Greek symbols is much much easier in LaTeX, and they look far better than those done with other typesetting programs.
- It is easy to change the format in the entire document, or to change how a particular expression is displayed throughout the entire document, with just a simple modification.

All in all, LaTeX is great for producing professional output, but I certainly don't use it for everything. I do, however, think it's a necessary tool for any scientist. Let's learn the basics!

Here is your first document:

```
\documentclass {article}
\begin {document}
Hello world!
\end {document}
```

Let's type this into a document on Overleaf.com and save it as test.tex . The ".tex" extension is used for LaTeX files. Let's look at these commands. Commands in LaTeX begin with the backslash "
". This is how you tell LaTeX the formatting you want, and also add any mathematical symbols, among other things. Some commands take multiple arguments. These are sometimes in square brackets as we'll see later.

The "documentclass" command tells LaTeX about how you want the document to look; "article" is a good standard. Anything above the "begindocument" command is the "preamble."

Your document is between the `\begin {document}` and `\end {document}` commands. Anything outside of these commands will not show up, although it can affect how the document appears.

You have to compile LaTeX documents in order to view them typeset. This can be done is Overleaf using the compile button. There are two main ways to do this from the command line. Method #1:
> latex test
> dvips test.dvi –o test.ps
> gv test.ps > ps2pdf test.ps
> evince test.pdf

The first command compiles the document into a "dvi" file. This filetype is like that of a postscript, but not quite. The second command creates a postscript (that is a letter "o") and the third command brings up a postscript viewer. The last two commands create and view a pdf file, if this is desired.

Method #2:
> pdflatex test
> evince test.pdf This is obviously faster, but doesn't work quite in all situations. NOTE: This may not work for inputting some graphics!

When you compile your document, you may get a bunch of errors. In general, you can ignore these if the output looks good. If it doesn't look good go to the line number of the error.

So that's it! Now let's learn some more advanced things.

Whitespace
Try adding whitespace to your file, recompiling it and looking at it. Try typing an additional line directly after "Hello World." What happens?

You can add the following whitespace:

line break [you can string multiple of these together] `\~` large space `\,` small space `\!` small negative space

The `\noindent` command will stop the indent and given you a little more control over formatting. The article document class by default indents every paragraph.

Text Formatting There are two main ways to add formatting to your document.

Method #1 – put the command within curly brackets {} Try this in your document:
```
{\bf Hello World!}
```

Everything outside the curly brackets will take the formatting.

Method #2 – start a new "environment" Try this:

```
\begin {centering}
Hello world!
\end {centering}
```

In this case anything within the begin and end commands will take the environment formatting.

Here are a few more useful commands:

`\it` – italics

`\Large` – really big text

`\large` – big text

`\normalsize` – normal size

`\small` – small

`\footnotesize` – even smaller

`\tiny` – very tiny

Equations LaTeX really shines when creating equations. All math symbols must be within the math environment. This is activated with the character "$", and must be ended with the same character. Try adding this to your file as a new line after "Hello World":

I have to graph `$y = mx + b$` and `$x^{2} + y^{2} = r^{2}$` and `$S_{\nu } = \frac {2 T k \nu ^2} {c^2}$` .

Then compile it and look at it.

The first equation is straightforward, but you'll notice the text is in italics as it should be. The second equation uses the `^` symbol for superscript. Anything within the following curly braces will be superscript. The third equation adds a subscript with the `_` symbol. You will also notice the `\nu` command, which inserts the Greek letter nu. All Greek letters can easily be added in this way, but they must be in the math environment. You can get capital letters by capitalizing the first letter, e.g., `\Nu` .

The `\frac` command takes two arguments, both in curly brackets. You should be able to see what it does.

There are tons more useful mathematical symbols and tricks. It's best just to look them up online as they come up.

Figures One way to insert files into the document is with the `\includegraphics` command. This command is usually put in the "figure" environment.

```
\begin {figure}[hb]
\centering
\includegraphics {myfig.eps}
\caption {Caption here.}
\end {figure}
```

To use this however, you will need to import the graphic package but putting the following command in your preamble:

```
\usepackage {graphicx}
```

Try these commands too if you like:

```
\includegraphics [width=60mm]{myfig.eps}
\includegraphics [height=6in]{myfig.eps}
\includegraphics [scale=0.75]{myfig.eps}
\includegraphics [angle=45,width=52mm]{myfig.eps}
```

Tables It may be best to just give a table example. There are tons of options with tables – see here: http://en.wikibooks.org/wiki/LaTeX/Tables

```
\begin {tabular}{ l c r }
1 & 2 & 3
4 & 5 & 6
7 & 8 & 9
\end {tabular}
```

The `\begin {tabular}` and `\end {tabular}` commands set up the table environment. The `\begin` command takes an argument for how you want the columns to be justified. You must have one entry per column ("l," "c," or "r"). Columns are separated with an ampersand `&` and rows are ended with two slashes `\\` .

Special Characters
If "$" means math environment, how do you actually make a "$" sign? For the most part, these special characters can be escaped using the backslash. For example, to make a dollar

sign, simply type “$.”