# Latex Tutorial

This tutorial was originally prepared by Joel Wein of MIT. You may find it helpful in preparing your notes. Anything I send you in the template file supercedes what is written here.
–Yishay

## 1 LaTeX

This section begins with the disclaimer that most of you probably know quite a bit about LaTeX. This is also not meant to be complete, just enough to get you started. If anyone charitable wants to write a section on somthing to be included feel free.

### 1.1 Text

LaTeXis a document preparation system that can do almost anything. I will present just the bare minimum. For more information and better explanations consult the manual.

A document must begin with

```
\begin{document}
```

and ends with

```
\end{document}
```

Before the

```
\begin{document}
```

line you may include a number of lines to set up new commands, change the margins, etc. This section is called the *preamble*. (I will provide all of this in the template file. -Isaac)

To get text nicely printed out in paragraphs you just type it in. A blank line after a block of text causes a new paragraph to be started. You may force a line break with a

```
\\
```

at the end of a line.

If you want to do much else you will need to use commands that begin with a backslash

```
\
```

This generally signals a LaTeX keyword. It may also be used in front of most characters that have LaTeX special meaning to display that character.

Two simple examples are how to center and emphasize italicize text. To center a line of text use the center environment:

```
\begin{center}
Line of Text 1\\
Line of Text 2\\
\end{center}
```

This will produce:

Line of Text 1<br>Line of Text 2

LaTeXhas a large number of environments to achieve various effects. We will see several more

To emphasize text use and

```
\em
```

For example,

```
{\em Emphasis}
```

produces: *Emphasis*

A useful fact is that a backslash followed by a space forces a space.

## 1.2 Sections

To divide your document into sections as is done here, at the start of a section you include a line

```
\section{Whatever the title of the section should be}
```

Subsections can be inserted with a header of:

```
\subsection{Title}
```

(For 6.852, you will use "topic" and "subtopic" macros to put sections in the notes. I will provide these. -Isaac)

## 1.3 List of items

If you wish to include a list of items in the text, one option is to use the enumerate environment:

```
\begin{enumerate}
\item This is the first item in the list
\item I am the second
\item I am last
\end{enumerate}
```

This will produce the following display:

1. This is the first item in the list

2. I am the second

3. I am last

## 1.4 Figures

You will probably need to include figures in your notes. The way to include a figure is with the figure environment:

```
\begin{figure}
  \vspace{1.5in}
  \caption{This is the caption}
\end
```

This will produce Figure 1 in this document. LaTeX will move figures around to where it sees fit, which is not always what you want. You can force them to the top or bottom by including `[t] or [b]` at the end of the first line. (See the template file for information on drawing pictures with latex. -Isaac)

Two other useful tasks to be accomplished here are defining new commands and theorem-like environments.

Theorem-like environments enable you to format lemmas, theorems, conjectures, in nice form such as this:

**Theorem 1** *This is where the statement of the theorem goes.*

Figure 1: This is the caption

That was accomplished by including in the preamble

```
\newtheorem{theorem}{Theorem}
```

and then placing in the text:

```
\begin{theorem}
This is where the statement of the theorem goes.
\end{theorem}
```

(All of this is provided in the template file so that the notes look uniform. -Isaac)

## 2 Math Mode

LaTeX has a special mode which produces pretty mathematical expressions. The simplest manifestation of this is for a single letter; If you have a graph $G$ it is pleasing to refer to it as $G$ as opposed to G. You may accomplish this by typing `$G$`. The pair of $'s are what delimit math mode. Expressions inside are interpreted as math expressions, and text is italicized.

Most greek letters and ugly math symbols have special LaTeXsymbols that consist of a backslash followed by some word. I.e. the symbol for alpha ($\alpha$) is

```
\alpha
```

Some other examples are

```
$ \forall \ \cap \ \heartsuit \ \oplus $
```

which produces:

$\forall \ \cap \ \heartsuit \ \oplus$

Note that the string of math symbols is surrounded by two $'s. Anything between the $'s are interpreted as math notation. Note the backslash- space's inserted to cause space between the symbols.

A list of all of these and many more appears on pp. 40-46 of the LaTeX manual. These are very important pages.

Other expressions that you will want are subscripts and superscripts.

To produce $x_i$ and $x^i$ you type:

```
$x_{i}$ and $x^{i}$.
```

Things can get more complicated:

```
$x^{x^{2} + y_{y^{3}}}$
```

yields

$x^{x^{2} + y_{y^{3}}}$

Here are some more examples:

$x^{2} + y_{i} \geq z_{i} \forall \ x^{2}$

$M \oplus M^{*}$ is a matching if $u \in S$.

They were produced by:

```
$x^{2} + y_{i} \geq z_{i} \forall \ x^{2}$

$M \oplus M^{*}$ is a matching if $u \in S$.
```

Finally, there are macros for writing programs, please use them. An example is given in the template file.

## 2.1 Running LaTeX

Here's how it should work. Your environment may be slightly different — ask a consultant.

After you have edited your file enter `latex filename.tex`. If it signals that some of your cross-references are not right, enter `latex filename.tex` again.

If you have no errors a .dvi file will be produced, which can be printed by the command `lpr -d filename.dvi`. [1]

If you have errors you will be thrown into an interactive mode with a variety of options you can find out about by typing a `?`.

You may also see what the file looks by using the command `xdvi filename.dvi`. (This will only work on a machine that supports xdvi.)

I hope these notes help you get a start in LaTeX. Good Luck!

[1] If this does not work, try `dvips -Pprintername filename.dvi`.