

# Some Tips on L<sup>A</sup>T<sub>E</sub>X

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## 1 Introduction

This is an introduction to L<sup>A</sup>T<sub>E</sub>X. L<sup>A</sup>T<sub>E</sub>X is a very powerful typesetting language that is freely available from, among other places, [www.miktex.org](http://www.miktex.org) (great for Windows users) and [www.tug.org/mactex](http://www.tug.org/mactex) (great for Mac users). If you use Linux or Unix, chances are that you already have L<sup>A</sup>T<sub>E</sub>X installed!

L<sup>A</sup>T<sub>E</sub>X really shines in its handling of:

1. Equations
2. Cross-referencing (for equations, figures, sections, etc.)
3. Bibliographies.

Thus, if you will be doing much technical writing, you should probably consider learning L<sup>A</sup>T<sub>E</sub>X. There is a superb book [1] on L<sup>A</sup>T<sub>E</sub>X that you may consider purchasing as well.

### 1.1 Compiling

L<sup>A</sup>T<sub>E</sub>X files must be *compiled* into one of several formats:

- **dvi** files. This is the default file output. It can be read by a dvi viewer. To generate a dvi file, simply type `latex myfile` at a command prompt, where “myfile.tex” is the name of your latex file. This produces a file called “myfile.dvi.”
- **ps** (postscript) files. These files can be read by programs such as **GhostView**. After running L<sup>A</sup>T<sub>E</sub>X to obtain a dvi file, you can do `dvips myfile` to generate a postscript file.
- **pdf** files that can be read by acrobat reader. You can generate a pdf file from a dvi file by doing `dvipdf myfile`, from a postscript file by doing `pstopdf myfile` or from a latex file directly by doing `pdflatex myfile`

Note that if you have a syntax error (this often occurs with equations) then you will see errors when compiling a L<sup>A</sup>T<sub>E</sub>X file.

## 2 General Formatting

Text appearing in the main body is automatically formatted. Extra spaces are ignored, as are carriage returns and indentations. L<sup>A</sup>T<sub>E</sub>X automatically indents as specified in the style settings.

New paragraphs are achieved by two carriage returns.

## 2.1 Paragraph Formatting

Quoted sections are formatted by indenting from both sides.

By using the `\begin{quotation}` command, both margins are indented. Furthermore, new paragraphs are not indented additionally.

Using the `\begin{quote}` command eliminates the additional tab character at the beginning of paragraphs in the quoted section.

## 2.2 Fonts

Roman Font

Typewriter Font

Sans Serif Font

SMALL CAPS

**Bold Face Font**

*Slanted*

*Italics*

### 2.2.1 Greek Lettering

$\alpha\beta\gamma\delta\epsilon\zeta$

$\eta\theta\iota\kappa\lambda\mu$

$\nu\xi\omicron\pi\rho\varrho$

$\chi\psi\omega$

$\Gamma\Delta\Theta\Lambda\Xi\Pi\Sigma\Upsilon$

$\Phi\Psi\Omega$

### 2.2.2 Calligraphic Letters

*ABCDEFGHIJKLMN OPQRSTUVWXYZ*

## 3 Bulleted lists and Numbered Lists

- Bullets with a black dot.
- Each entry is distinguished by the `item` keyword.

→ Any symbol may be used as a bullet!

Numbered lists may also be easily created.

1. First entry
2. Second entry
3. and so on...

### 3.0.3 Outlines

Outlines may be created by nesting any of the bullets or numbered lists described above.

## 4 Creating Equations

Equations and symbols may be put into the text easily as  $x_{i,j,k}^n$ , or on their own line. For Example, The *gamma function*  $\Gamma(x)$  is defined as

$$\Gamma(x) \equiv \lim_{n \rightarrow \infty} \prod_{\nu=0}^{n-1} \frac{n!n^{x-1}}{x+\nu} = \lim_{n \rightarrow \infty} \frac{n!n^{x-1}}{x(x+1)(x+2)\cdots(x+n-1)} \equiv \int_0^{\infty} e^{-t}t^{x-1} dt$$

for  $x > 0$ .

### 4.1 Multi-Line Equations

Equations which take several lines may be entered so that the number appears on any or all of the lines. Use the & character to delineate the left, mid, and right portions of the equation. Use the `\nonumber` command to eliminate numbering on a given line of a multiline equation.

$$\begin{aligned} (x+y)(x-y) &= x^2 - xy + xy - y^2 \\ &= x^2 - y^2 \\ (x+y)^2 &= x^2 + 2xy + y^2 \end{aligned} \tag{1}$$

We can reference equation (1) and (2) easily by using their labels. Other examples are:

$$\begin{aligned} \arcsin x &= -\arcsin(-x) = \frac{\pi}{2} - \arccos x = \left[ \arccos \sqrt{1-x^2} \right] \\ &= \arctan \frac{x}{\sqrt{1-x^2}} = \left[ \operatorname{arccot} \frac{\sqrt{1-x^2}}{x} \right] \end{aligned} \tag{3}$$

and

$$\begin{aligned} f(x+h, y+k) &= f(x, y) + \left\{ \frac{\partial f(x, y)}{\partial x} h + \frac{\partial f(x, y)}{\partial y} k \right\} \\ &+ \frac{1}{2} \left\{ \frac{\partial^2 f(x, y)}{\partial x^2} h^2 + 2 \frac{\partial^2 f(x, y)}{\partial x \partial y} kh + \frac{\partial^2 f(x, y)}{\partial y^2} k^2 \right\} \\ &+ \frac{1}{6} \{ \dots \} + \dots + \frac{1}{n!} \{ \dots \} + R_n \end{aligned}$$

Single equations may also be framed:

$$\boxed{\mathbf{Ax} = \mathbf{b}} \tag{4}$$

In class, we use vectors a lot. I typically represent a vector in bold face. You can do this by  $\mathbf{u}_i$ , for example. A few more examples:

$$(\mathbf{j}_i^u) = [B^{ou}](\mathbf{j}). \tag{5}$$

$$\mathbf{j} = \rho_i(\mathbf{u}_i - \mathbf{v}) \tag{6}$$

$$\frac{\partial \rho \mathbf{u}}{\partial t} = -\nabla \cdot (\rho \mathbf{u} \otimes \mathbf{u}) - \nabla \cdot \boldsymbol{\tau} - \nabla p + \rho \mathbf{g}. \tag{7}$$

## 5 Figures

Figures may be incorporated into  $\text{\LaTeX}$  documents fairly easily. The best format for including figures is `eps` format. MATLAB can export figures in this format. See Figure 1. You can convert images from other formats (`jpg`, `gif`, etc) to `eps` using ImageMagick. See [www.imagemagick.org](http://www.imagemagick.org) to download this for Windows & Mac. Linux systems likely have this pre-installed. Just type `convert myimage.jpg myimage.eps` to convert your image file (from `jpg` to `eps` in this example).

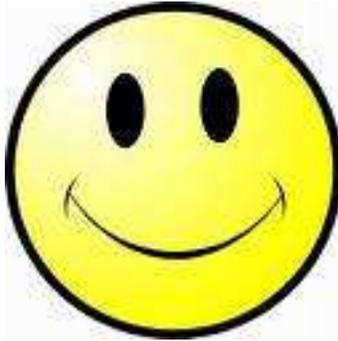


Figure 1: This is the figure caption.

## References

- [1] Helmut Kopka & Patrick W. Daly. *A Guide to  $\text{\LaTeX}$* . Addison–Wesley Co., Inc., Harlow, England, 1999.