

Help on L^AT_EX

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This document was created using L^AT_EX. L^AT_EX is a typesetting tool, meaning that you type in the text only. L^AT_EX will then do all the formatting for you. Now, sometimes you may not like the formatting that L^AT_EX chooses. You can force L^AT_EX to do the formatting you want, but this is more advanced, so we will cover that later if we have time.

A document begins with the `documentclass` command which takes the form:

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

Instead of 12pt you can use 11pt or 10pt for font size. Instead of article you can use document style options including chapter, book, report. For AMS type articles and formatting, you can use amsart. For a PowerPoint-like presentation, you can use prosper. These options will change things such as how sections are numbered or if chapters are included.

The text of a document is enclosed by a `\begin{document}` and a `\end{document}` commands. Commands preceding the `\begin{document}` are called preamble and include things such as margins, redefining commands and using any external packages. We will get to this later.

L^AT_EX commands begin with a `\`. Many commands occur in pairs to create an environment. Typical environments include math, list-making, table or figure environments. These paired commands are typed

```
\begin{name} ... \end{name}
```

where *name* is commonly one of center, enumerate, equation, eqnarray, itemize, figure, table, tabular, theorem.

1 Basic Formatting: Text Environment

1.1 Paragraphs, Lines and Special Characters

Text is typed as normal. You separate paragraphs with a blank line; for forced line breaks use `\`.

There are 10 special characters which are interpreted as commands unless they are typed specially. The 7 characters `# $ % & - { }` must be preceded by a `\`; for example `\#`. The other 4 are as follows:

use `\backslash` for `\`,

use `\sim` for `~`,

use `\^` for `^` as `\^` will treat `^` as an accent and put it over a letter. For example, `m\^o` for `mö`.

To format your text with bold or italics, surround the text with `{ }` and use `\bf` for **bold font** and `\em` or `\it` for *italics font*.

1.2 Dashes

Three different sizes of dashes can be produced by typing one, two or three characters. Use one dash for an intra-word dash or hyphen: x-ray; use two for a medium dash for number ranges: 1–5; use three for a punctuation dash—like this.

1.3 Spaces

`\LaTeX` assumes a period or question mark ends a sentence and puts a bit of extra space after a sentence. To tell `\LaTeX` that a period does not end a sentence, place a `\` after the period (or question mark, etc.): Hurdal et al.\ showed that to be true.

Sometimes it is necessary to force a space to be inserted after a word, particularly after a built in command or a command you may redefine. Use `\`; for example `\LaTeX\`.

Often you may want to prevent a line break between certain words, such as in Figure 1 you probably don't want the text to break between the word Figure and 1. Use `~` between the two words you want to keep together: `Figure~1`.

1.4 Quotes

Use ‘ (often on the same key as ~) for a left quote ‘, and use ’ (apostrophe) for a right quote ’. Putting two together will create double quotes as in ‘‘double quotes’’: “double quotes”.

1.5 Simple Formulas

A formula appearing in the middle of a sentence is enclosed by `\(\)` or surrounded with `$`. For example, here is the formula $x + 5y = 10$. Math formulas are displayed in italic font.

1.6 Sectioning Commands

The document class determines what sectioning commands are provided and how they are formatted. Sectioning commands begin with `\`, such as `\section` and include part, chapter, section, subsection, subsubsection, paragraph, subparagraph. The title of the section is surrounded by `{ }`. For example, this paragraph is a subsection, given by `\subsection{Sectioning Commands}`. A `*` in a sectioning command will cause no section number to be produced. For example `\subsection*{Sectioning Commands}` would not produce the number 1.6 in the subsection title.

1.7 Labels for Referring to Previous Items by Number

Things which are automatically numbered in \LaTeX , such as sections, equations, figures and tables can be assigned a label so you can refer to them by number later in the text. The label command is `\label{name}`, where *name* is any text you want to name the label, such as `\label{subsec:labels}`. The label must occur after the item to be labeled, which means it must occur after any section command or after a caption command in a figure or table. You use the `\ref{label}` command to then refer to your label and thus the number to which that label refers. For example, this subsection has number 1.7.

2 Basic Formatting: Math Environment

As indicated in Section 1.5, a formula appearing in the middle of a sentence is surrounded by $\$$. An equation can be written on a separate line by enclosing it with $\backslash[\backslash]$ or surrounding it by $\$\$$. However, these methods do not assign numbers to the equations.

2.1 Single Equations

A single equation can be assigned a number by enclosing it within the $\backslash\begin{equation} \dots \backslash\end{equation}$ commands. Of course, you can assign a label to this equation as discussed in Section 1.7. Note that the command $\backslash\begin{equation*} \dots \backslash\end{equation*}$ would not include an equation number and so this is the same as surrounding the equation with $\$\$$. \LaTeX automatically determines the spacing. If your equation is too long for one line and you need to force it onto two lines then you need to use the eqnarray command discussed in the next section.

2.2 Multiple Equations

Equations or mathematics with multiple lines are often best written with the $\backslash\begin{eqnarray} \dots \backslash\end{eqnarray}$ commands because you can assign equation numbers to all or only some of the lines and you can line the equations one under the other, such as around an equals sign or other operator. At the end of each equation line, use $\backslash\backslash$ or $\backslash\text{label}\{\text{name}\} \backslash\backslash$ or $\backslash\text{nonumber} \backslash\backslash$ to give the equation line a number or a label and a number or no equation number respectively. If all of your equations will have no equation numbers, then you can use $\backslash\begin{eqnarray*} \dots \backslash\end{eqnarray*}$.

The eqnarray command is really creating an array with 3 columns. You indicate each of your 2 column breaks with $\&$. Typically the column breaks occur around the equals sign in the equations. Here is an example of the \LaTeX commands, followed by their output:

The model is given by

```

\begin{eqnarray}
\label{eqn:aryinh}
V(R,\alpha,\beta) &= & \frac{1}{4\pi\sigma R^2} \sum_{n=1}^{\infty} \frac{2n+1}{n} f^{n-1} \left[ \frac{\xi(2n+1)^2}{d_n(n+1)} \right] \\
&& \left[ nm_r P_n(\cos \alpha) + m_t \cos \beta P_n^1(\cos \alpha) \right] \end{eqnarray}

```

where

```

\begin{eqnarray*}
d_n &= & [(n+1)\xi+n] \left[ \frac{n\xi}{n+1} + 1 \right] - n(1-\xi)^2 \left( \frac{f_1}{f_2} \right)^{2n+1} \\
&& + (1-\xi)[(n+1)\xi+n](f_1^{2n+1} - f_2^{2n+1}).
\end{eqnarray*}

```

The model is given by

$$V(R, \alpha, \beta) = \frac{1}{4\pi\sigma R^2} \sum_{n=1}^{\infty} \frac{2n+1}{n} f^{n-1} \left[\frac{\xi(2n+1)^2}{d_n(n+1)} \right] \cdot [nm_r P_n(\cos \alpha) + m_t \cos \beta P_n^1(\cos \alpha)] \quad (1)$$

where

$$d_n = [(n+1)\xi+n] \left[\frac{n\xi}{n+1} + 1 \right] - n(1-\xi)^2 \left(\frac{f_1}{f_2} \right)^{2n+1} + (1-\xi)[(n+1)\xi+n](f_1^{2n+1} - f_2^{2n+1}).$$

2.3 Math Symbols

Math symbols must be typed in a math environment, i.e. within $\$$ or an equation command. Many math symbols, especially Greek symbols, are intuitive, other are not. For Greek symbols, type the symbol name in lower or upper case with \backslash . For example, $\backslash\phi$ gives ϕ and $\backslash\Phi$ give Φ . Similarly, functions are generally their common abbreviation: $\backslash\sin$, $\backslash\cos$, $\backslash\tan$, $\backslash\log$, $\backslash\exp$. There are many web sources available that list all the different math symbols.

2.4 Regular Text with an Equation

A math equation appears in italics. To have regular text within an equation, such as the word “and” or “for”, requires the $\backslash\mbox{\text}$ command. Note

that any whitespace surround your text must also occur within the `mbox` command. For example,

```
\begin{eqnarray}
a & = & b \mbox{ and } \\
c & = & d.
\end{eqnarray}
```

$$a = b \text{ and} \tag{2}$$

$$c = d. \tag{3}$$

2.5 Beware: Common Formatting Errors

When writing mathematics in a document, there are two common errors that new technical writers make. First, the mathematics equation is an English sentence in your document. Thus, punctuation must be used correctly. For example, end a sentence (even if it ends in an equation) with a period, separate lists (of equations) with commas, etc.

Another common error is too much white space around the equation. If the equation is part of a paragraph, do not introduce a blank line between the paragraph and the `\begin{equation}` command. If more text follows the equation that is part of the same paragraph, do not follow the `\end{equation}` command with a blank line. Introducing many blank lines causes paragraph breaks, resulting in excessive white space surrounding the equations.

3 Running L^AT_EX, Viewing and Printing your Document

On a Unix machine, to run L^AT_EX, type `latex documentname`, where *documentname.tex* is your L^AT_EX file. You may need to run L^AT_EX twice in order to reference items within your document (more on this later). The output is a file `documentname.dvi`. This can be viewed using `xdvi documentname`. The document can be printed to a postscript printer using `dvips documentname`, or saved as a postscript file use the `-o` option to name/save the output

postscript; for example `dvips documentname -o mydocument`. The output will be a file called `mydocument.ps`.

You can create a pdf file by running the command `pdflatex documentname`. The output produced is called `documentname.pdf` and can be viewed with any pdf viewer.

There are also free programs available for \LaTeX on other platforms. MiKTeX is a good version of \LaTeX for Windows and TeXnicCenter is an editor that integrates with MiKTeX (and other \LaTeX programs) for developing \LaTeX documents under Windows.