

My First L<sup>A</sup>T<sub>E</sub>Xdocument  
aka.  
A Beginner's Guide to L<sup>A</sup>T<sub>E</sub>X

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# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Font-Related</b>	<b>1</b>
2.1	Diverse Font Styles . . . . .	1
2.2	Colorful Outputs . . . . .	1
2.3	Font Size . . . . .	2
<b>3</b>	<b>Enumerate &amp; Itemize</b>	<b>2</b>
3.1	Paragraph indent . . . . .	2
3.2	Enumerate . . . . .	2
3.3	Itemize . . . . .	3
<b>4</b>	<b>Special Symbols</b>	<b>3</b>
4.1	Spacing and Explanatory Notes . . . . .	3
4.2	Special Symbols . . . . .	4
<b>5</b>	<b>Graphs</b>	<b>4</b>
5.1	Tabular . . . . .	4
5.2	Image . . . . .	5
<b>6</b>	<b>Formulas</b>	<b>7</b>
6.1	Inserting Formulas . . . . .	7
6.2	Special Symbols . . . . .	8
<b>7</b>	<b>References</b>	<b>9</b>
7.1	Intro . . . . .	9
7.2	BibTeX file format . . . . .	9
7.3	Inserting a List of references . . . . .	9
7.4	Reference Annotation . . . . .	10
7.5	Citation Format . . . . .	10
<b>8</b>	<b>Conclusion</b>	<b>11</b>

# Welcome to L<sup>A</sup>T<sub>E</sub>X.

Science is what we understand  
well enough to explain to a  
computer, Art is all the rest.

---

*Donald Knuth*

## 1 Introduction

This is the Introduction.

L<sup>A</sup>T<sub>E</sub>X is a widely-used software system for typesetting documents. blah  
blah blah...In short, it is an awesome way to write well-structured and fully-  
in-control documents.

Anyway, as you have come this far so as to discover this doc, I may as  
well cut out the piffle. So, Let's plunge right in!

## 2 Font-Related

### 2.1 Diverse Font Styles

There are a variety of text styles in L<sup>A</sup>T<sub>E</sub>X:

*words in italics*

*words slanted*

WORDS IN SMALLCAPS

**words in bold**

words in teletype

sans serif words

roman words

underlined words

### 2.2 Colorful Outputs

This part demonstrates the powerful capacities of L<sup>A</sup>T<sub>E</sub>X to output colors.  
Note that this only happens after using `\usepackage{color}`

flame

water

background color

Lakers suck

## 2.3 Font Size

normal size words

tiny words

scriptsize words

footnotesize words

small words

large words

Large words

LARGE words

huge words

## 3 Enumerate & Itemize

### 3.1 Paragraph indent

L<sup>A</sup>T<sub>E</sub>X's default setting is that at the start of the first paragraph in every section, there would be no indent. Every other paragraph aside from those ones would have indent as default.

If you don't want any indent in a specific paragraph, adding the command `\noindent` before the intended paragraph would help.

If you want all of your paragraphs to be of noindent use this command:

`\setlength{\parindent}{0pt}`

somewhere in the .tex file and all the paragraphs following this cmd would have no indent

### 3.2 Enumerate

LaTeX Supports two kinds of Lists:

A Sorted List(enumerate) and An Unsorted List(itemize)

The elements in the list can be defined as `\item` and Lists can have Sublists

1. First thing
2. Second thing
  - A sub-thing

- Another sub-thing

### 3. Third thing

We could use [parameter] to change the representation of items in an Unsorted Lists For instance, \item[-] will use a slash as the new representation You could even use a Word for representation,e.g. \item[One]

- First thing

+ Second thing

aaa A sub-thing

bbb Another sub-thing

Q Third thing

## 3.3 Itemize

# 4 Special Symbols

## 4.1 Spacing and Explanatory Notes

We use % to create a explanatory note within the same line , all characters after this % would be ignored until the next line begins.

For example:

*It is a truth universally acknowledged % Note comic irony  
in the very first sentence  
, that a single man in possession of a good fortune, must  
be in want of a wife.*

would come out as:

*It is a truth universally acknowledged  
in the very first sentence  
, that a single man in possession of a good fortune, must  
be in want of a wife.*

In LaTeX ,multiple consecutive spaces would be seen as one.

Multiple consecutive empty lines would also be seen as one.

The main objective for using an empty line is to start a new paragraph.

In most circumstances, LaTeX ignores empty lines and other symbols representing spacing, Note that two backslashes(\\)could be used to switch to a new line.

If you want to add spaces in your doc, you could use the cmd:  
`\vspace{...}` In this way, we can create vertical spaces, where the height of the space can be assigned.

For instance, `\vspace{12pt}` will create a space, which has the height of a character with 12pt in height

## 4.2 Special Symbols

These are considered Special symbols in  $\text{\LaTeX}$ :

`# $ % ^ & _ { } ~ \`

You could refer to the  $\text{\LaTeX}$  version of this document to see how these symbols were typed in.

Note that when using symbols: `^` and `~`, we need to push a pair of `{}` right after using these symbols. Otherwise, they would be inferred as hats of characters that follows, just like `^e` would be interpreted as  $\hat{e}$ .

Also Note that, backslash can NOT be typed in by simply adding Another backslash before it (or else it would do the line wrapping thing) The right way is to use the command: `\textbackslash` to substitute it.

Try typing the following sentence just to get a hang of what I mean:

*Item #A\642 costs \$8 \& is sold at a ^10% profit.*

## 5 Graphs

### 5.1 Tabular

The command `\tabular` is used to typeset tabulars.  $\text{\LaTeX}$ 's default is that there are no horizontal or vertical separation lines, so if you need those, you'll have to set it manually.  $\text{\LaTeX}$  will automatically assign the width of the tabular based on its content. use:

`\begin{tabular}{...}`

to create a tabular;

The dots should be replaced by the following:

- `l`: the column will align to the left
- `r`: the column will align to the right
- `c`: the column will align to the center
- `|`: stands for a vertical line

For instance, `{lll}` will create a tabular of three columns, aligned to the left, and no vertical separation lines.

While `{|l|l|r|}` will generate a three-column tabular, with the first two columns aligned to the left and the last column aligned to the right, there would be vertical separation lines between columns

Insert the data of the tabular after: `\begin{tabular}{...}`

- `&` :to separate columns
- `\\` :to switch rows
- `\hline` :to insert a horizontal line that will cross all columns
- `\cline{1-2}` :to add a horizontal separation line between row 1 and row 2

Lastly, remember to use `\end{tabular}` to end the tabular.

Here are some examples (You may wanna use them to practice using tabulars yourself):

Apples	Green	Apples	Green
Strawberries	Red	Strawberries	Red
Orange	Orange	Oranges	Orange

8	here's	Item	Quantity	Price(\$)
86	stuff	Nails	500	0.34
2008	now	Wooden boards	100	4.00
		Bricks	240	11.50

City	2006	2007	2008
London	45789	46551	51298
Berlin	34549	32543	29870
Paris	49835	51009	51970

## 5.2 Image

In this subsection, we are going to introduce how to insert graphics in  $\text{\LaTeX}$ .

Here, we need to include the **graphicx** package. Note that the picture should be in the format of PDF, PNG, JPEG or GIF. The following code will insert a image named "myimage".

```
\begin{figure}[h]
\centering
\includegraphics[width=1\textwidth]{myimage}
```

```

\caption{Here is my image}
\label{image-myimage}
\end{figure}

```

[h] represents the parameter for the location of the picture,  
h represents placing the image right **HERE** (if there is enough space)  
There are other options:

**t** :represents placing the image on the **TOP** of the page;

**b** :represents placing the image on the **BOTTOM** of the page;

**p** :represents placing the image on a **NEW PAGE**;

You could also add a ! parameter to assign the picture to a specific place mandatorily.

(Although in this way, the results might be horrible)

\centering will place the picture at the center of the page. without this command, LaTeX's default will align the picture to the left. This command is really useful because it will also assigned the title of the picture to the middle.

The command \includegraphics{...} can add the picture into your document automatically. Note that the picture should be placed under the same directory with the Tex file.

[width=1\textwidth] is an optional parameter, It assigns the width of the picture to be the same with the text. Width can also be set using cm. We could also use [scale=0.5] to shrink the scale of the picture.

\caption{...} defines the title(caption) of the picture. By using that, LaTeX will assign a serial number starting with "Figure". Afterwards, you could use \listoffigures to generate a directory of all the graphs.

\label{...} generates a label which you can refer to.

REMARK: Don't forget to use the command

```
\usepackage{graphicx}
```

before using the functions above(LoL).

Here is an example:



Figure 1: Demo Fig.



## 6 Formulas

### 6.1 Inserting Formulas

There are mainly four ways to insert Formulas in LaTeX files.

1. To create a formula within the same line use `$...$`

Other ways that exists include:

- `\( ... \)`
- `\begin{math}... \end{math}`

For example:  $B^0(X_0, \delta) = \{x \in \mathbb{R}^n | 0 < ||X - X_0|| < \delta\}$

2. To create a formula that starts off with a new line, use `$$...$$`

For example:

$$\aleph_0^{\aleph_0} = \aleph_1$$

3. To create equations with numbers, use:

`\begin {equation}`

...

`\end {equation}`

For example:

$$f(X) = f(X_0) + Jf(X_0)\Delta X + \frac{1}{2!}(\Delta X)^T H_{(X_0+\theta\Delta X)}\Delta X \quad (1)$$

4. If we want to take the equations to a next level: A series of equations, we might want to start using the command:

`\begin {eqnarray}`

...

`\end {eqnarray}`

For example:

$$\int_{A'}^{A''} f(x, y)g(x, y)dx = g(A', y) \int_{A'}^{\xi} f(x, y)dx + g(A'', y) \int_{\xi}^{A''} f(x, y)dx \quad (2)$$

$$I(y) = \int_{\alpha(y)}^{\beta(y)} f(x, y)dx \quad (3)$$

$$\frac{d}{dy}I_y = \int_{\alpha(y)}^{\beta(y)} \left[\frac{\partial f}{\partial y}(x, y)\right]dx + f(\beta(y), y)\beta'(y) - f(\alpha(y), y)\alpha'(y) \quad (4)$$

We can use `& ... &` between different lines to align them in a way that the dots in different lines are aligned together.

## 6.2 Special Symbols

There are literally loads of Symbols and Letters that would take up dozens of papers just to list them all on the script.

Therefore, it is my firm belief that the best way to learn language it by putting it in real-life scenarios and grab what you need and add them to your inventory.

The following is a great website where one could find reference to most commonly-used math symbols and such.

<http://www.uinio.com/Math/LaTeX/>

So what we are covering here might just as well be a beginning of what a typical -Tex users would get familiar with.

1. `\frac{...}{...}`

This is used to represent fractions

For instance:  $\frac{x}{\ln x}$

2. `\sqrt{...}`

This is used for squareroots.

For example:  $\sqrt[3]{\pi}$

3. `\sum_{...}^{...}` `\int_{...}^{...}` `\prod_{...}^{...}`

These stand for adding discrete stuff up; adding continous stuff up(to be specific under Riemann's condition); and multiplying discrete stuff up;

Examples:

$$\sum_{i=0}^{10} a_i \quad (5)$$

$$\int_0^a \Gamma(t) dt \quad (6)$$

$$\prod_{i=1}^m b_i \quad (7)$$

After a while, you will find yourself more and more used to the Greek alphabet as well as some Heubric characters.

REMARK:  $\xi$  would be printed using the command `\xi` (At least in China This character is usually mispronounced as well as written in very diverse ways lol)

However, if you happen to use vscode+ the extension: LaTeX Workshop to edit .tex files, you'll find a bar named "SNIPPET VIEW" on the left hand side, where you could possibly find the characters that you might be looking for.

## 7 References

### 7.1 Intro

LaTeX can easily deal with insert reference files and directories. In this section, we are going to explore how LaTeX does this by storing the reference files in BibTeX.

### 7.2 BibTeX file format

BibTeX should include all the files you want to refer to. It's suffix is .bib.

The name of the .bib file should be set to be identical with your .tex file.

.bib is a document file in which you may wanna insert your reference articles in this format:

```
@ article{
Transformer_Model,
Author = {A Vaswani,N Shazeer,N Parmar,J Uszkoreit,L Jones,AN Gomez,L
Kaiser and I Polosukhin},
Title = {Attention {I}s {A}ll {Y}ou {N}eed},
Journal = {arXiv},
Volume = {50},
Pages = {9-19},
Year = {2017}
}
```

With every referenced doc, we should first define it's reference type. The demo is in @article type, other types include @book, @incollection for citing chapters in a book, @inproceedings to cite conference papers.

After that, we write down a citation key. Please make sure each referenced doc uses a different key. You can name it whatever you want, but it's better to settle down with a certain kind of format.

The next few lines should contain information about the file:

The general format is:

**Field name = field contents**

For Capitalized character, use braces to cover them. BibTeX will automatically de-Capitalized all characters aside from the first char in the title.

You could write BibTeX files manually, but there are also software that generates these files for you.

### 7.3 Inserting a List of references

Use the following code to generate this list right at the spot in the .tex file.

```
\bibliographystyle{plain}
\bibliography{references}
Write the cited articles in references.bib
```

## 7.4 Reference Annotation

Use `\cite{citationkey}` to generate an annotation at the intended spot. If you don't want to insert an annotation in the main body, yet still want the reference list to display this citation, use the command `\nocite{citationkey}`.

To also include the page information of the reference article, use `\cite[p. 215]{citationkey}`.

Use `,` to separate multiple cited articles. For example:

```
\cite{citation01,citation02,citation03}
```

## 7.5 Citation Format

### 1. Citing by Numbers

$\LaTeX$  includes multiple ways to use numbers to cite reference articles:

- Plain  
Uses `[ num ]` as the format.  
For instance, `[1]`. The article's authors will be listed based on the Lead Author's name's dictionary order. Every Author's name would be written down in full name.
- Abbrev  
Same with Plain but the authors' names would be abbreviated.
- Unsrtd  
Same with Plain but the order of the cited articles will be based on the sequence the main body cites them.
- Alpha  
Same with Plain but the annotation would be in the format of `[NameAbbrev+num]`.  
For example: `[Ker10]`

### 2. Citing by Date

If you want to use the format of Name+Date, include the package `"natbib"`.

It uses the command: `\citep{...}` to generate the desired format of citation for instance `[Koppe,2010]`. Use `\citet{...}` to only put the year in the `[...]` part, For example, `Koppe [2010]`.

The Natbib package has three formats:

**plainnat,abbrvnat & unsrtnat**

They are identical to **plain,abbrev & unsrt**.

### 3. Other forms of citation

If you plan on using different citation formats, create a .bst file under the same directory, cite this format by using the command:

```
\bibliographystyle{...}
```

## 8 Conclusion

Let's wrap it up. In this document, we learned the basics of using LaTeX to get the desired output of our files. We focused on Font-Related issues; Creating Paragraph and lists(both sorted and unsorted) as well as special symbols,graphs,formulas and references.

Remember? This is the output of reference by using label which we discussed in the second section:

Referring to 2.1 on page 1

If you do remember, congrats! If you don't, no worries, just go over it a few more times. As we all know, language is no barrier for the sharp-witted, data structures & algorithms, those are stuff that really takes a bit of talent to learn. Learning L<sup>A</sup>T<sub>E</sub>X? It's just the kind of technical skill that only takes time to excel. Good luck on your journey with LaTeX as well as other journeys in life. May the Force be with you.

I'll leave you here with a "itemize" of Further Reading:

- **OI-Wiki** <https://oi-wiki.org/tools/latex/>
- **The T<sub>E</sub>XBook** *Donald Knuth*
- **L<sup>A</sup>T<sub>E</sub>XProject** <http://www.latex-project.org/>
- **L<sup>A</sup>T<sub>E</sub>XWikiBook** <http://en.wikibooks.org/wiki/LaTeX/>

Many thanks for OIWiki's LaTeX learning webpage, which I used for reference (to a great extent lol), the github repo for this proj is at

## List of Figures

1	Demo Fig. . . . . .	6
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