

L^AT_EX Tutorial

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1 Elementary Knowledge

1.1 Source Code

1.1.1 Space

- Continuous space characters are considered as one space character.
- The space characters at the beginning of each line will be ignored.
- Single LF(Line Feed) will be considered as a space.

- L^AT_EX uses empty line to end the paragraph.
- Multiple LF will be considered as one LF.

1.1.2 Special Characters

These characters are special characters in L^AT_EX, which are commonly used for special functions. If want to display these characters, you should add `\` before characters.

`# $ % ^ & _ { } ~ \`
`\\` is used to end the line.¹

1.1.3 L^AT_EX Commands

- Commands is case- sensitive.
- L^AT_EX ignores the space behind the commands. If you want to add space behind the commands, you can add `{ }` and a space behind the commands.

1.1.4 Annotation

L^AT_EX will ignore all the context behind `%`

2 Document Typesetting

2.1 Tokenize in words

Command `\mbox{text}` ensures to set multiple words on the same line.

2.2 Special Characters

2.2.1 Dash and Hyphen

- `-` : hyphen(one)
- `–` : short dash(two)

¹`\backslash` will generate `\`.

- `—` : `long dash(three)`

2.2.2 Tilde

- `~` : `\~`
- `~` : `\sim`

2.2.3 Angle

- `°C` : `$^{\circ}`

2.2.4 Ellipsis

- `...` : `\ldots`

2.3 Words' Seperator

- The backslash before the space can generate a non-extended space
- `~` can generate a non-extended space and forbid newline
- `\@` before period indicates the period is the end of sentence.

2.4 Cross Quotation

`\label{marker}, \ref{marker}, \pageref{marker}`

A reference to this subsection looks like: "see section 2.4 on page 4."

2.5 Footnote

`\footnote{ footnote text }`

2.6 Emphasize

- `underline` : `\underline{text}`
- `emphasize` : `\emph{text}`

2.7 Environment

`\begin{environment} text \end{environment}`

2.7.1 Itemize, Enumerate, and Description

- itemize : set up simple list
- enumerate : set up list with index
- description : set up list with description

2.7.2 Flushleft, Flushright, and Center

- Flushleft : generate a paragraph arranged to the left
- Flushright : generate a paragraph arranged to the right
- center : generate a paragraph arranged to the center.

2.7.3 Quote, Quotation, and Verse

- quote : to quote phrase or examples
- quotation : to quote long paragraph
- verse : to quote poems

2.7.4 Table

`\begin{tabular}{table spec}`

table spec :

- l : to generate a column arranged to the left
- r : to generate a column arranged to the right
- c : to generate a column arranged to the center
- | : to generate a plumb line
- p{*width*} : to generate a column with specific width

In tabular environment, use `&` to jump to next column; use `\\` to start a new row; use `\hline` to insert horizontal lines; use `\cline{i-j}` to insert part of horizontal line (i, j represent the index of start column and end of column).

3 Mathematics Formula

3.1 Elementary Knowledge

It is supposed to set mathematics expression like :

- `\ (expression \)`
- `$ expression $`
- `\ begin{math} expression \ end{math}`

For large expression, it is suggested to use *display* mode, like :

- `\ [expression \]`
- `\ begin{displaymath} expression \ end{diplaymath}`

However, this environment has no index. To append index for formula, you can use *equation* environment.

There are differences between *mathematics mode* between *text mode*. In *mathematics mode*

1. Space and FL will be ignored, space is instead by commands like `\,`, `\quad` or `\qquad`.
2. Empty line is forbidden. Each formula must belongs to only one paragraph.
3. Every character will be considered as a variable name. If you want to add normal text, you must use command `\textrm{text}` to input text.

Commonly, it is suggested to use blackboard bold to represent the set of real numbers. Use command `\mathbb` to use this fonts.

3.2 Commands

3.2.1 Greek letters

Lowercase Greek letters : $\alpha, \beta, \gamma, \dots$

Oppositely, to get Uppercase Greek letters : $\Gamma, \Delta, \Sigma, \dots$

3.2.2 Square Root

- \sqrt{x} : \sqrt{x}
- $\sqrt[n]{x}$: $\sqrt[n]{x}$
- $\sqrt{}$: $\sqrt{}$

3.2.3 Horizontal Line

- $\overline{m+n}$: $\overline{m+n}$
- $\underline{m+n}$: $\underline{m+n}$
- $\overbrace{a+b+\dots+z}^{26}$: $\overbrace{a+b+\dots+z}^{26}$
- $\underbrace{a+b+\dots+z}_{26}$: $\underbrace{a+b+\dots+z}_{26}$

3.2.4 Arrow

- \vec{a} : \vec{a}
- \overleftarrow{AB} : \overleftarrow{AB}
- \overrightarrow{AB} : \overrightarrow{AB}

3.2.5 Binomial

- $\binom{n}{k}$: $\binom{n}{k}$
- n_k : n_k

3.2.6 Binary Relationship

- $\stackrel{!}{=}$: `\stackrel{!}{=}`

3.2.7 Brace Size

- $((((($: `\big(\Big(\bigg(\Bigg(`
- $)))$: `\big) \Big) \bigg) \Bigg)`

3.2.8 Dots

- \ldots : `\ldots`
- \cdots : `\cdots`
- \vdots : `\vdots`
- \ddots : `\ddots`

3.3 Space

- \backslash : $\frac{3}{18}\text{quad}_{\sqcup}$
- $\backslash:$: $\frac{4}{18}\text{quad}_{\sqcup}$
- $\backslash;$: $\frac{5}{18}\text{quad}_{\sqcup}$
- \backslash_{\sqcup} : $\frac{1}{2}\text{quad}_{\sqcup}$
- $\backslash\text{quad}$: quad_{\sqcup}
- $\backslash\text{qqquad}$: 2quad_{\sqcup}

3.4 Vertical Alignment

3.4.1 Arrays

$$\bullet = \left(\begin{array}{ccc} x_{11} & x_{12} & \dots \\ x_{21} & x_{22} & \dots \\ \vdots & \vdots & \ddots \end{array} \right) : \begin{array}{l} = \text{\texttt{\backslashleft(\backslashbegin{array}\{ccc\}} \\ \text{\texttt{x_{11} \& x_{12} \& \ldots \}} \\ \text{\texttt{x_{21} \& x_{22} \& \ldots \}} \\ \text{\texttt{\vdots \& \vdots \& \ddots}} \\ \text{\texttt{\backslashend{array}\backslashright)}} \end{array}$$

$$\bullet = \left\{ \begin{array}{ccc} a & \dots & \\ b+x & \dots & : \\ l & \dots & \end{array} \right. \begin{array}{l} = \text{\texttt{\backslashleft\{ \backslashbegin{array}\{ll\}} \\ \text{\texttt{a \& \texttt{\textbackslashtextrm\{\ldots\}} \}} \\ \text{\texttt{b+x \& \texttt{\textbackslashtextrm\{\ldots\}} \}} \\ \text{\texttt{l \& \texttt{\textbackslashtextrm\{\ldots\}} \}} \\ \text{\texttt{\backslashend{array}\backslashright.}} \end{array}$$

$$\bullet = \left(\begin{array}{c|c} 1 & 2 \\ \hline 3 & 4 \end{array} \right) : \begin{array}{l} = \text{\texttt{\backslashleft(\backslashbegin{array}\{c|c\}} \\ \text{\texttt{1 \& 2 \}} \\ \text{\texttt{\backslashhline}} \\ \text{\texttt{3 \& 4 \}} \\ \text{\texttt{\backslashend{array}\backslashright)}} \end{array}$$

3.4.2 Equations

$$f(x) = \cos x \quad (1)$$

$$f'(x) = -\sin x \quad (2)$$

$$\int_0^x f(y)dy = \sin x \quad (3)$$

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots \quad (4)$$

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots \quad (5)$$

`\nonumber` will forbid L^AT_EX to generate a index.

3.5 Theory and Definitions

`\newtheorem{name}{counter}{text}[section]`

Additionally, you should excute commands in preamble first, like :

Law 3.1 *Don't hide in the witness box*

```

1 \begin{law}
2     Don't hide in the witness box
3 \end{law}
```

3.6 bold

It is hard to get bold characters in L^AT_EX. You can use command `\mathbf`, but these roMan characters will be vertical, however, mathematics symbols commanly are *italic*. Here is one command `\boldmath` to get *italics* fonts, but only valid in *M*athematics mode. Also the package *amsbsy* and *bm* can easily realize it, for they contain the command `\boldsymbol`

4 DIY L^AT_EX

4.1 Fonts and Size

- text : `\small`
- text : `\Large`

- **bold face** : `\textbf`
- *italic* : `\textit`
- **roman** : `\textrm`

4.2 Distance in Objects

4.2.1 Paragraph

You can use `\indent` to indent a unindent paragraph.

Also, you can use `\noindent` to creat a non-indent paragraph.

4.3 Box

You can use `\parbox[pos]{width}{text}` to put a paragraph into a box.

Also, you can use `\begin{minipage}[pos]{width} text \end{minipage}`

to do the same function.

command `\makebox[width][pos]{text}` has more powerful functions.

Width define the width observed from the outside of the box. You can push `\width`, `\height`, `\depth`, to parameter. These variable values are obtained by measureing the context in the box. *Pos* accept 4 characters: **c**-center, **l**-left arragned, **r**-right arranged, **s**-spread context evenly.