

L^AT_EX At A Glance, v. 1.0

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Abstract

This guide contains a short visual introduction to L^AT_EX, the popular programming language used to typeset articles in math, science, and engineering. If you have questions or suggestions, please email me at kiemyang@umd.edu.

1 Getting Started

L^AT_EX files are simply text files with a `.tex` extension, e.g., `hello.tex`. Edit the file, then compile it into PDF using the command `pdflatex hello.tex` (in Unix). The output will be `hello.pdf`.

A bare document looks like this:

```
\documentclass{article}
\begin{document}
Hello, world.
\end{document}
```

Create this file, compile using `pdflatex`, then display.

For more information, visit ctan.org and tex.stackexchange.com. Or search for one of many L^AT_EX tutorials.

Unless otherwise stated, the following code excerpts should be entered inside the `document` environment.

2 Document Structure

Title, author, date, and abstract

```
\title{My First Document}
\author{Steve Tjoa}
\date{February 8, 2011}
\maketitle
\begin{abstract}
This is my first document.
\end{abstract}
Body text goes here.
```

Sections (numbered and unnumbered)

```
\section{Math}
\subsection{Calculus}
\subsubsection{Derivatives}
\section*{Math}
\subsection*{Calculus}
\subsubsection*{Derivatives}
```

3 Environments

Bulleted list

```
\begin{itemize}
\item Item 1
\item Item 2
\end{itemize}
```

- Item 1
- Item 2

Numbered list

```
\begin{enumerate}
\item Item 1
\item Item 2
\end{enumerate}
```

1. Item 1
2. Item 2

Description list

```
\begin{description}
\item[Theorem 1] Item 1
\item[Theorem 2] Item 2
\end{description}
```

- Theorem 1** Item 1
- Theorem 2** Item 2

Quote

```
Benjamin Franklin once wrote:
\begin{quote}
They who can give up essential liberty to obtain a little temporary safety,
deserve neither liberty nor safety.
\end{quote}
```

Benjamin Franklin once wrote the following:

They who can give up essential liberty to obtain a little temporary safety, deserve neither liberty nor safety.

Verbatim text

```
\begin{verbatim}
for i in range(3, 7):
    print '\%#@$!*{}[]'
\end{verbatim}
```

```
for i in range(3, 7):
    print '\%#@$!*{}[]'
```

Tables

```
\begin{tabular}{l|cr}
abc & qwe & zxc \\
\hline
abcd & qwer & zxcv \\
abcde & qwert & zxcvf
\end{tabular}
```

abc	qwe	zxc
abcd	qwer	zxcv
abcde	qwert	zxcvf

```
\begin{table}
\centering
\begin{tabular}{l|cr}
abc & qwe & zxc \\
\hline
\hline
abcd & qwer & zxcv \\
abcde & qwert & zxcvf
\end{tabular}
\caption{First example table.}
\label{exampletable}
\end{table}
See Table \ref{exampletable}.
```

abc	qwe	zxc
abcd	qwer	zxcv
abcde	qwert	zxcvf

Table 1: First example table.

See Table 1.

4 Text Formatting

Comments

```
Hello,  
% anything on the same line after a % symbol is not processed  
world.
```

Hello, world.

Font style and size

```
\textit{italics} \textbf{bold}  
\texttt{typewriter} \textsc{Small Caps}
```

italics **bold** typewriter SMALL CAPS

```
\tiny tiny \scriptsize scriptsize \footnotesize footnotesize \small small  
\normalsize normalsize \large large \Large Large \LARGE LARGE \huge huge \Huge Huge
```

tiny scriptsize footnotesize small normalsize large Large LARGE huge Huge

Quotation marks

```
‘ ‘Yes.’ ’ ’No.’
```

“Yes.” ”No.”

Accents

```
\'a \'a \=a \~n \c{c} \"o \^{o} \'i \'i \"i \i
```

á à ã ñ ç ö ô í ï ÿ

Hyphens and dashes

```
Thirty-three. Pages 10--15.  
The dash --- typed like this --- delimits a parenthetical aside.
```

Thirty-three. Pages 10–15. The dash — typed like this — delimits a parenthetical aside.

5 Math Mode

Inline formula

If c is the length of a hypotenuse of a right triangle, then $c = \sqrt{a^2 + b^2}$.

If c is the length of a hypotenuse of a right triangle, then $c = \sqrt{a^2 + b^2}$.

Equation with numbering

```
\begin{equation}
x_1 + x_2 = x_3
\end{equation}
```

$$x_1 + x_2 = x_3 \quad (1)$$

Formula without numbering

```
\[ \sum_{k=0}^{\infty} r^k = \frac{1}{1-r} \]
```

$$\sum_{k=0}^{\infty} r^k = \frac{1}{1-r}$$

Multiline formula with alignment

```
\begin{eqnarray}
x &=& y + z \\
&=& v
\end{eqnarray}
```

$$\begin{aligned} x &= y + z \\ &= v \end{aligned} \quad (2)$$

Boxed equations

```
\[ \boxed{ x = y^2 + z_1 } \]
```

$$\boxed{x = y^2 + z_1}$$

Boxed multiline equations

```
\[ \boxed{ \begin{array}{l} x &=& y^2 + z \\ &=& v_1 \end{array} } \]
```

$$\boxed{\begin{aligned} x &= y^2 + z \\ &= v_1 \end{aligned}}$$

Accents in math mode

```
\[ \underline{a} \vec{a} \hat{a} \bar{a} \tilde{a} \\ + \dot{a} + \ddot{a} + \dddot{a} + \ddddot{a} \]
```

$$\underline{a} \vec{a} \hat{a} \bar{a} \tilde{a} + \dot{a} + \ddot{a} + \dddot{a} + \ddddot{a}$$

Greek letters

```
\[ \alpha \beta \gamma \delta \epsilon + \zeta \eta \theta \iota \kappa +
  \lambda \mu \nu \xi \pi + \rho \sigma \tau \upsilon \phi +
  \chi \psi \omega \]
```

$$\alpha\beta\gamma\delta\epsilon + \zeta\eta\theta\iota\kappa + \lambda\mu\nu\xi\pi + \rho\sigma\tau\upsilon\phi + \chi\psi\omega$$

```
\[ \Gamma \Delta \Theta \Lambda \Xi \Pi + \Sigma \Upsilon \Phi \Psi \Omega \]
```

$$\Gamma\Delta\Theta\Lambda\Xi\Pi + \Sigma\Upsilon\Phi\Psi\Omega$$

Special characters

```
\[ l + \ell + \epsilon + \varepsilon \]
```

$$l + \ell + \epsilon + \varepsilon$$

```
\[ 100\% + \$100 + #100 \]
```

$$100\% + \$100 + \#100$$

```
\[ \forall x \in \Re, \exists y \in \Im \text{ such that } x = jy. \]
```

$$\forall x \in \mathbb{R}, \exists y \in \mathbb{I} \text{ such that } x = jy.$$

Functions

```
\[ \cos \sin \exp \log \lg \min \max_a \lim_{x \rightarrow \infty} \Pr(a \in A) \]
```

$$\cos \sin \exp \log \lg \min \max_a \lim_{x \rightarrow \infty} \Pr(a \in A)$$

Arrays and matrices

```
\[ A = \left[ \begin{array}{cc}
a_{11} & a_{12} \\
a_{21} & a_{22} \end{array} \right] \]
```

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$$

```
\[ \left( \begin{array}{c} x_1 \\ x_2 \end{array} \right) \left\{ \begin{array}{c} y_1 \\ y_2 \end{array} \right\} \]
```

$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} \left\{ \begin{array}{c} y_1 \\ y_2 \end{array} \right\}$$

```
\[ F(x) = \left\{ \begin{array}{l}
0, \quad x < 0, \\
x, \quad 0 \leq x < 1, \\
1, \quad \text{otherwise.} \end{array} \right. \]
```

$$F(x) = \begin{cases} 0, & x < 0, \\ x, & 0 \leq x < 1, \\ 1, & \text{otherwise.} \end{cases}$$

6 Preamble

The *preamble* is the part of a L^AT_EX file before `\begin{document}`.

Packages

The command `usepackage` will import a package. Here are some useful ones.

```
\usepackage{amsmath,amssymb,amsfonts} % American Mathematical Society resources
\usepackage{graphicx}                  % necessary for \includegraphics
\usepackage{hyperref}                  % creates hyperlinks in cross references
\usepackage{fullpage}                  % widens page body, reduces margins
\usepackage{enumerate}                 % customized numbering in enumerate environment
\usepackage{caption}                   % customized captions
\usepackage{fancyvrb}                  % customized verbatim environment
```

New command

```
\documentclass{article}
\newcommand{\Am}{\mathbf{A}}
\newcommand{\R}{\mathbb{R}}
\begin{document}
\[ \Am \in \R^{m \times n} \]
\end{document}
```

$$\mathbf{A} \in \mathbb{R}^{m \times n}$$

New command with arguments

```
\documentclass{article}
\newcommand{\pd}[1]{\frac{\partial}{\partial #1}}
\begin{document}
\[ \pd{a} f(a, b) \]
\end{document}
```

$$\frac{\partial}{\partial a} f(a, b)$$

New math operator

```
\documentclass{article}
\DeclareMathOperator*{\argmin}{argmin}
\begin{document}
\[ \argmin_a f(a, b) \]
\end{document}
```

$$\argmin_a f(a, b)$$

7 Figures

The `\includegraphics` command requires the package `graphicx`. When compiling with `pdflatex`, graphic files should be in PDF, PNG, or JPEG format.

```
\includegraphics[scale=0.5]{umdlogo.pdf}
```



```
\begin{figure}
\centering
\includegraphics[scale=0.7]{umdlogo.pdf}
\caption{University of Maryland logo.}
\label{logo}
\end{figure}
See Figure \ref{logo}.
```



Figure 1: University of Maryland logo.

See Figure 1.

Subfigures

You may use the `subfigure` package, but `minipage` gives more control.

```
\begin{figure}
\centering
\begin{minipage}[b]{2in}
\centering
\includegraphics[scale=0.5]{umdlogo.pdf}
\caption{UMD logo.}
\end{minipage}
\begin{minipage}[b]{3in}
\centering
\includegraphics[scale=0.4]{gaussian.pdf}
\caption{Generalized Gaussian functions.}
\end{minipage}
\end{figure}
```

```
\caption{The entire figure.}
\end{figure}
```



Figure 2: UMD logo.

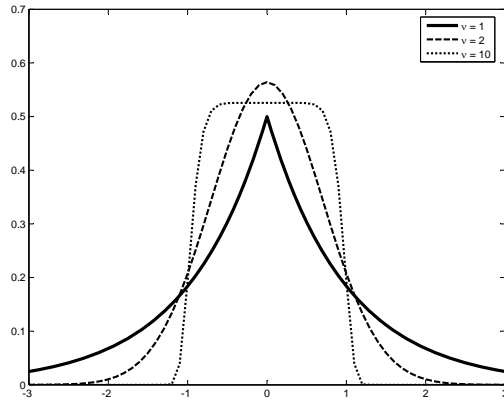


Figure 3: Generalized Gaussian functions.

Figure 4: The entire figure.

Side captions

```
\begin{figure}
\centering
\begin{minipage}{1in}
\centering
\includegraphics[scale=0.5]{umdlogo.pdf}
\end{minipage}
\begin{minipage}{2in}
\caption{UMD logo.}
\end{minipage}
\end{figure}
```



Figure 5: UMD logo.

8 Bibliography

```
\begin{document}
% ... document body ...
\bibliography{refs}
\bibliographystyle{plain}
\end{document}
```

Create a text file in the same directory named `refs.bib`:

```
@article{tjoa2011,
author = "Steve Tjoa",
title = "P equals NP",
journal = "J. Theory of Computation",
pages = "100--120",
month = feb,
year = "2011",
volume = "43",
number = "2"
}
```

To build, you must run the following commands:

1. `pdflatex hello.tex`
2. `bibtex hello.aux`
3. `pdflatex hello.tex`
4. `pdflatex hello.tex`