

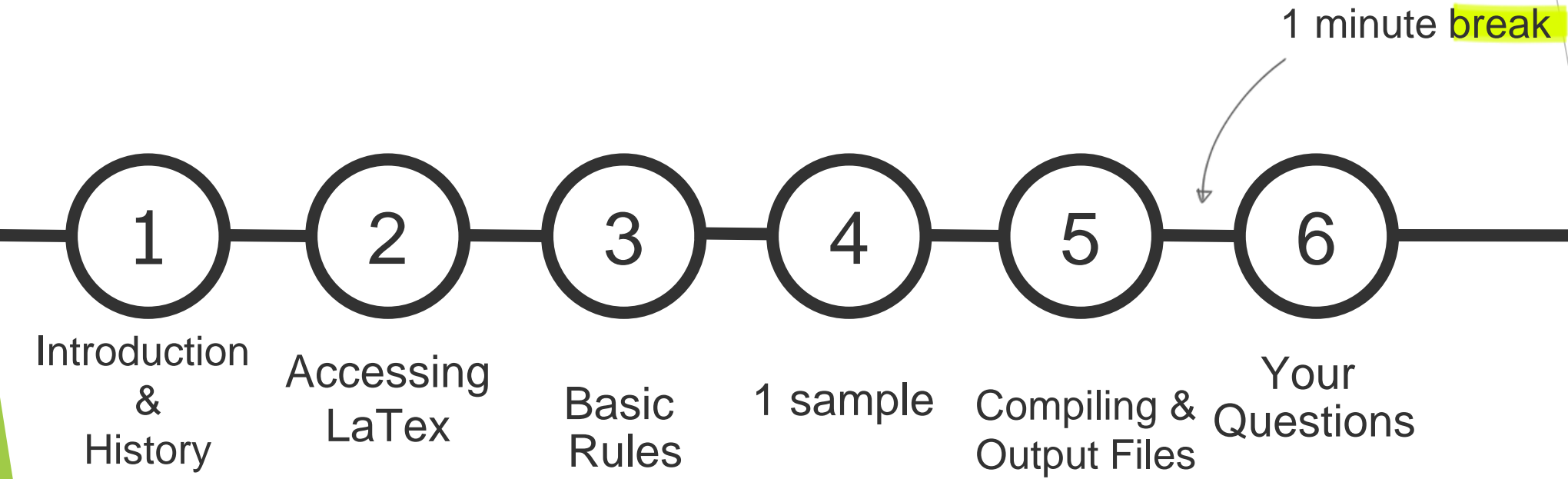
LaTeX tutorial

How to setup and write in LaTeX

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November 22th, 2015

L^AT_EX

Agenda



What is LaTeX?

► LaTeX

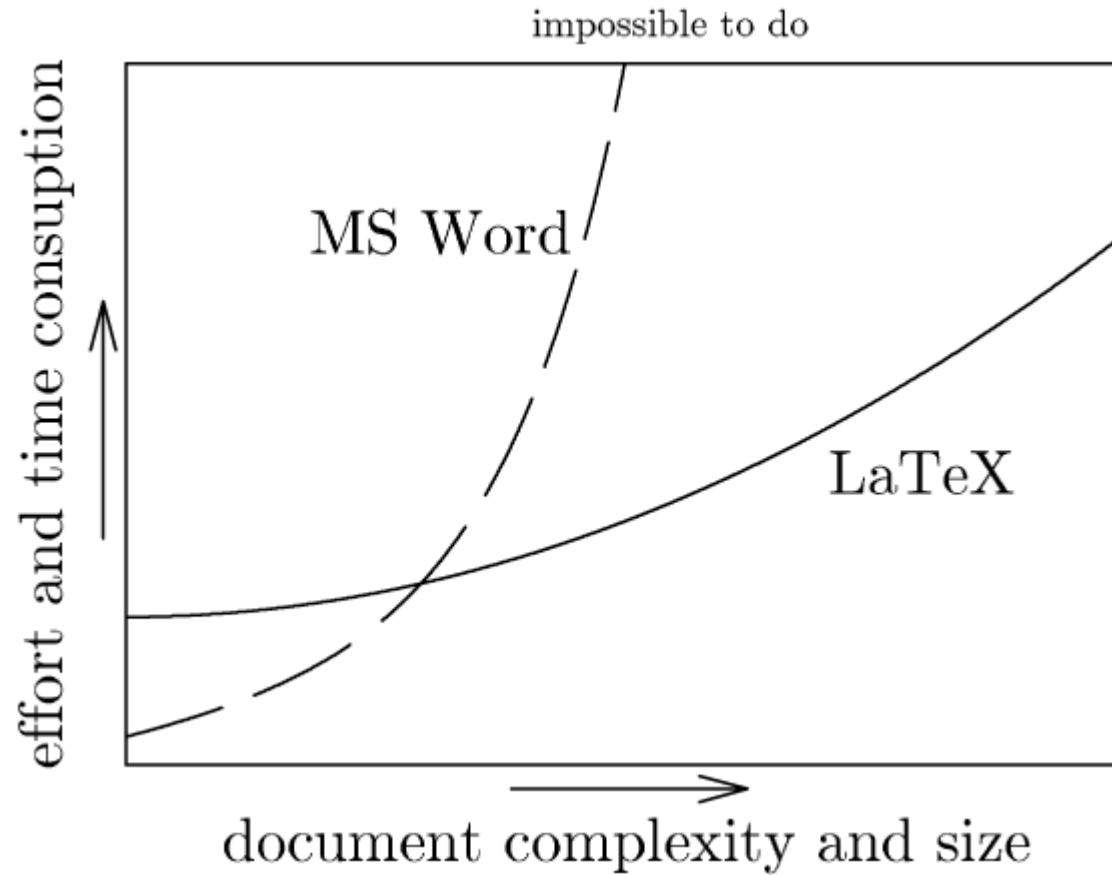
- a document markup language and document preparation system for the TeX typesetting program
- to create a document in LaTeX, a .tex file must be created using some form of text editor.
- is widely used in academia, because of the high quality of typesetting achievable by TeX
- The version numbers of TeX are converging toward π , with a current version number of 3.1415926
- e for pen size

History: TeX and LaTeX

- ▶ Donald Knuth created TeX in the late 70s so he could typeset his famous *Art of Computer Programming* books
- ▶ TeX produced great output and was very powerful (and programmable) but also very obscure
- ▶ Leslie Lamport of SRI produced LaTeX in the early 80s as a macro package making TeX easy to use
- ▶ They both have won Turing Award
- ▶ I've never know anyone who used TeX directly



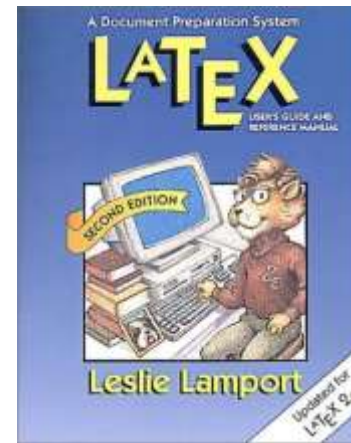
Why not MS Word?



[8]<http://www.jaftalks.com/wp/index.php/latex-or-microsoft-word-in-it-organization/>

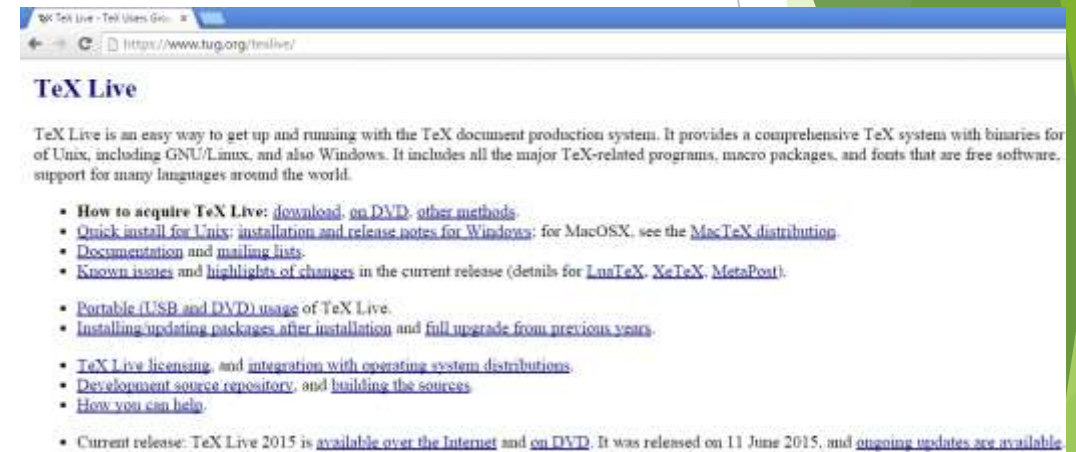
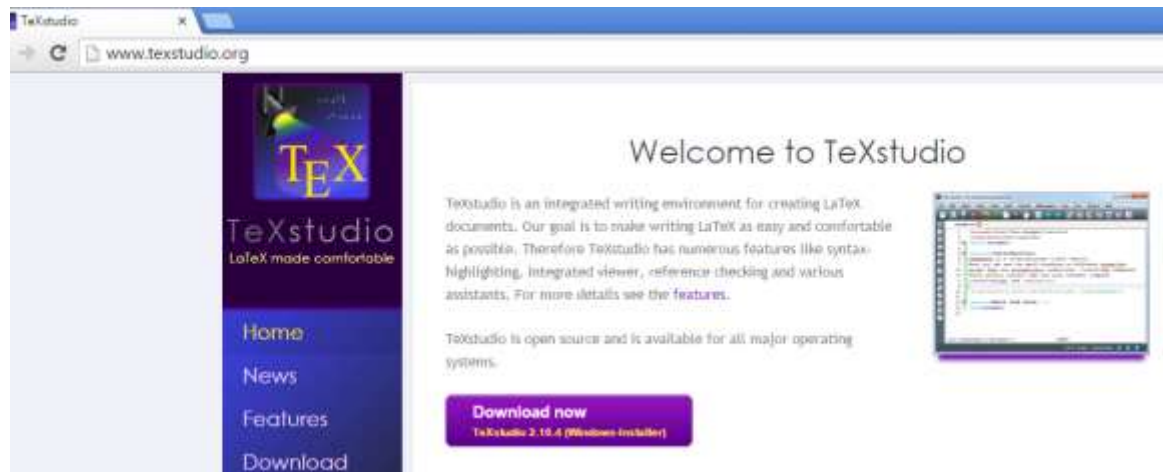
Why LaTeX

- ▶ It's good for complex documents like a dissertation
- ▶ It's the standard for Computer Science, Mathematics and many other STEM fields
 - ▶ Many conferences have their own LaTeX document
 - ▶ Elsevier uses LaTeX to typeset all their journals
- ▶ LaTeX's bibliography system, BibTex, is the best
- ▶ LaTeX is programmable!
- ▶ LaTeX is open source software, has a large community of users and developers and a good infrastructure (e.g., CTAN.org , latex-project.org)



Accessing LaTeX

- ▶ Latex and associated tools are typically pre-installed on Linux and Mac OS X
- ▶ Use [TeXlive](https://www.tug.org/texlive/) or [TeXstudio](https://www.textstudio.org) for Windows



- ▶ ParsiLatex, Tex Farsi and xepersian

LaTeX Files

- ▶ The input for LaTeX is a plain ASCII text file.
- ▶ You can create it with *any* text editor.
- ▶ It contains
 - ▶ the text of the document
 - ▶ commands which tell LaTeX how to typeset the text.
 - ▶ Spaces
 - ▶ Special Characters
 - ▶ LaTeX Commands
 - ▶ Comments
- ▶ Files containing structure and layout definitions (.sty)
- ▶ Tex formatted output file (.dvi)
- ▶ Others:
 - lof (list of figures), .lot (list of tables), .bib (bibliography)

Special Characters

- ▶ The following symbols are reserved characters, that
 - ▶ have a special meaning in LaTeX

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

- ▶ Some of these characters can be used in your documents by adding a prefix **backslash** (escape character):

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

- ▶ The other symbols (and many more!) can be printed with special commands in mathematical formulae.

LaTeX Commands

- ▶ LaTeX commands are case sensitive and take one of two formats:
 - ▶ They start with a backslash `\` and have a name consisting only of letters.
 - ▶ They consist of a backslash and exactly one special character.

Input File Structure (1)

- ▶ When LaTeX2e processes an input file it expects it to follow a certain structure. Every input file starts with the command:

```
\documentclass[options]{class}
```

- ▶ `\documentclass[11pt,twoside,a4paper]{article}`
- ▶ This specifies what sort of document you intend to write (article, letter, book, thesis, etc.)
- ▶ After that, you can include global style commands or you can load packages which add new features to the LaTeX system. To load a package you use the command:

```
\usepackage[options]{package}
```

Input File Structure (2)

- ▶ When all the setup work is done, you start the body of the text with the command:

```
\begin{document}
```

- ▶ Now you enter the text mixed with some useful LaTeX commands.
- ▶ At the end of the document you use the

```
\end{document}
```

command, which tells LaTeX to finish. Anything which follows this command will be ignored by LaTeX

sample.tex

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

Latex comands start with a backslash, required args are in {}, options in []s

```
\usepackage{ifthen}
```

Start by declaring the document **class** (article) and use the 12pt option setting the font size

```
\begin{document}
```

Loads required packages defining commands or setting parameters

```
\title{Hello World in LaTeX}
```

```
\author{My Name Goes Here}
```

```
\maketitle
```

LaTeX uses begin|end commands for blocks. Every document must have a document block

```
Hello, world!
```

The title and author command set document variables and the maketitle command generates the output text

```
{\em Hello, world!}
```

```
{\bf Hello, world!}
```

Paragraphs are separated by blank lines

```
{\Large \bf Hello, world!!!}
```

{ }s introduce un-named blocks and control scope. \em for italics, \bf for bold, \Large to increase font size

```
\end{document}
```

Hello World in LaTeX

My Name Goes Here

November 19, 2015

Hello, world!
Hello, world!
Hello, world!
Hello, world!!!

Document Classes	
<code>article</code>	For articles in scientific journals, presentations, short reports, program documentation, invitations, ...
<code>IEEEtran</code>	For articles with the IEEE Transactions format.
<code>proc</code>	A class for proceedings based on the article class.
<code>report</code>	For longer reports containing several chapters, small books, thesis, ...
<code>book</code>	For real books.
<code>slides</code>	For slides. The class uses big sans serif letters.
<code>memoir</code>	For changing sensibly the output of the document. It is based on the <code>book</code> class, but you can create any kind of document with it

Document Class Options

<code>10pt, 11pt, 12pt</code>	Sets the size of the main font in the document. If no option is specified, 10pt is assumed.
<code>a4paper, letterpaper, ...</code>	Defines the paper size. The default size is <code>letterpaper</code> ; However, many European distributions of TeX now come pre-set for A4, not Letter, and this is also true of all distributions of pdfLaTeX. Besides that, <code>a5paper</code> , <code>b5paper</code> , <code>executivepaper</code> , and <code>legalpaper</code> can be specified.
<code>leqno</code>	Places the numbering of formulas on the left hand side instead of the right.
<code>titlepage, notitlepage</code>	Specifies whether a new page should be started after the document title or not. The article class does not start a new page by default, while report and book do.
<code>twocolumn</code>	Instructs LaTeX to typeset the document in two columns instead of one.
<code>twoside, oneside</code>	Specifies whether double or single sided output should be generated. The classes <code>article</code> and <code>report</code> are single sided and the <code>book</code> class is double sided by default. Note that this option concerns the style of the document only. The option <code>twoside</code> does not tell the printer you use that it should actually make a two-sided printout.
<code>landscape</code>	Changes the layout of the document to print in landscape mode.

Sections

`\section{Section Title}`

`\subsection{Title}`

`\subsubsection{Title}`

```
\section{Section Title}
section 1 is here
\subsection{Title}
section 1.1 is here
\subsubsection{Title}
section 1.1.1 goes here
```



1 Section Title

section 1 is here

1.1 Title

section 1.1 is here

1.1.1 Title

section 1.1.1 goes here

Font size

`\tiny \scriptsize \footnotesize`

`\small \normalsize`

`\large \Large`

`\LARGE \huge`

`\Huge`

```
..... -
{\LARGE Hello World!!} \\
  {\normalsize Hello World!!} \\
    { \tiny Hello World!!} \\
..... -
```

Hello World!!
Hello World!!
Hello World!!



Comments

- ▶ When LaTeX encounters a % character while processing an input file, it ignores the rest of the present line.
- ▶ This is useful for adding notes to the input file, which will not show up in the printed version.

This text is processed. % A comment isn't

This text is
processed.

Typesetting Mathematics

- ▶ LaTeX has a special mode for typesetting mathematics, called “math mode”.
- ▶ Within a paragraph, math mode is entered **between \$** characters, or by using the `\begin{math}` and `\end{math}` commands

To find the square of the hypotenuse, add a squared to b squared to find c squared, e.g.
`$a^2 + b^2 = c^2$`. It's as easy as that!

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Typesetting Mathematics

Greek Symbols

`\alpha`, `\beta`, `\gamma` \longrightarrow α , β , γ

Superscript, Subscript

`x^y` \longrightarrow x^y `x_y` \longrightarrow x_y `x_y^z` \longrightarrow x_y^z

Calculus

`\int_0^\infty` \longrightarrow \int_0^∞ `\int\int` \longrightarrow \iint

`\frac{\partial u}{\partial x}` \longrightarrow $\frac{\partial u}{\partial x}$

`x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}`

`\TeXForm[\sqrt{b^2 - 4ac}]`

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Cross-referencing

`\label{marker}`

`\ref{marker}`

`\pageref{marker}`

► Example:

`\section{Introduction}`

`\label{intro}`

...

As mentioned in section `\ref{intro}` in page `\pageref{intro}`

Typesetting Mathematics

- ▶ In a research paper or thesis, you will often want to number equations and refer to them in the text
- ▶ This is done using the `equation` environment, and the commands `\label` and `\ref`

... it is clear that

$$\varepsilon > 0. \quad (1)$$

From Equation 1 it follows that
...

```
\ldots it is clear
that
\begin{equation}
\varepsilon > 0.
\label{eq:eps}
\end{equation}
From
Equation~\ref{eq:eps}
it follows that
\ldots
```

- ▶ (note that `\label` and `\ref` are used with figures and tables too)

Typesetting Mathematics

- ▶ Matrices are produced using the `\textbf{array}` environment. Example:

The *characteristic polynomial* $\chi(\lambda)$ of the 3×3 matrix

$$\begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix}$$

is given by the formula

$$\chi(\lambda) = \begin{vmatrix} \lambda - a & -b & -c \\ -d & \lambda - e & -f \\ -g & -h & \lambda - i \end{vmatrix}.$$

$$\text{TeXForm}\left[\begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}\right]$$

The `\emph{characteristic polynomial}` `$\chi(\lambda)$` of the `3×3` matrix

```
\[ \left( \begin{array}{ccc} a & b & c \\ d & e & f \\ g & h & i \end{array} \right)
```

is given by the formula

```
\[ \chi(\lambda) = \left| \begin{array}{ccc} \lambda - a & -b & -c \\ -d & \lambda - e & -f \\ -g & -h & \lambda - i \end{array} \right| .\]
```

Including Graphics

- ▶ LaTeX2e includes a standard package for including *PostScript* graphics in your document. Load it using

```
\usepackage{graphics}
```

- ▶ A figure can be included using, for example, `\begin{figure}[placement specifier]`

```
\usepackage{caption}
```

```
\raggedleft
```

```
\begin{figure}[h]
```

```
\centering
```

```
\includegraphics[width=0.6\linewidth]{ "mypic" }
```

```
\caption{Friends for  $2.1 < T_c < 2.6$ }
```

```
\label{fig:magnetforsometc}
```

```
\end{figure}
```

Figures and Tables

- ▶ Figures & Tables cannot be broken between pages

- ▶ They are “floated”

```
\usepackage{caption}
```

```
\begin{figure}
```

```
\includegraphics[option]{sample}
```

```
\caption{A sample figure.}
```

```
\end{figure}
```


Tabular

► Columns

► `\begin{tabular}{|...|...|}`

► `\end{tabular}`

► Rows


► `&` - Split text into columns

► `\\` - End a row

► `\hline` - Draw line under row

► e.g. `123123 & 34.00\\ \hline`

Two Columns



l = automatically adjust
size, left justify
r = automatically adjust
size, right justify
p = set size
e.g p{4.7cm}
c = centre text

Example of table

```
\begin{tabular}{|l|r|c|} \hline
Date & Price & Size \\ \hline
Yesterday & 5 & Big \\ \hline
Today & 3 & Small \\ \hline
\end{tabular}
```

Date	Price	Size
Yesterday	5	Big
Today	3	Small

Bibliographies

- ▶ Articles can be referred to in the text using the `\cite` command
- ▶ The details of the cited articles are stored in BibTeX format, in a “.bib” file.
- ▶ BibTeX resolves the citations in the LaTeX file and generates the required bibliography

```
Partl~\cite{pa} has  
proposed that \ldots  
\begin{thebibliography}{99}  
\bibitem{pa} H.~Partl:  
\emph{German \TeX},  
TUGboat Volume~9, Issue~1 (1988)  
\end{thebibliography}
```

Partl [1] has proposed that ...

Bibliography

[1] H. Partl: *German T_EX*, TUGboat Volume 9, Issue 1 (1988)

BibT_EX

Compiling with pdflatex

> **pdflatex sample**

This is pdfTeX, Version 3.1415926-1.40.10 (TeX Live 2009)

entering extended mode

(./sample.tex

LaTeX2e <2009/09/24> ...

(/usr/local/texlive/2009/texmf-dist/tex/latex/base/article.cls

Document Class: article 2007/10/19 v1.4h Standard LaTeX
document class

(/usr/local/texlive/2009/texmf-dist/tex/latex/base/size12.clo))

...

Output written on sample.pdf (1 page, 29675 bytes).

Transcript written on sample.log.



Compiling, old school

> **latex sample**

This is pdfTeX, Version 3.1415926-1.40.10 (TeX Live 2009)

...

Output written on sample.dvi (1 page, 652 bytes).

Transcript written on sample.log.

> **dvips sample -o sample.ps**

This is dvips(k) 5.98 Copyright 2009 Radical Eye Software
(www.radicleye.com)

'TeX output 2011.01.31:0857' -> sample.ps

...

> **ps2pdf sample.ps**

>



Output Formats

- ▶ **.dvi** Device Independent
- ▶ **.ps** Post Script
- ▶ **.pdf** PDF
- ▶ **.rtf** Rich Text Format
- ▶ **.html** HTML
- ▶ **.xml** XML

References

- [1] Leslie Lamport. LATEX: A Document Preparation System. Addison-Wesley, Reading, Massachusetts, second edition, 1994, ISBN 0-201-52983-1.
- [2] Donald E. Knuth. The TEXbook, Volume A of Computers and Typesetting, Addison-Wesley, Reading, Massachusetts, second edition, 1984, ISBN 0-201-13448-9.
- [3] Frank Mi \ddot{u} elbach, Michel Goossens, Johannes Braams, David Carlisle, Chris Rowley. The LATEX Companion, (2nd Edition). Addison-Wesley, Reading, Massachusetts, 2004, ISBN 0-201-36299-6.
- [4] Michel Goossens, Sebastian Rahtz and Frank Mi \ddot{u} elbach. The LATEX Graphics Companion. Addison-Wesley, Reading, Massachusetts, 1997, ISBN 0-201-85469-4.
- [5] Each LATEX installation should provide a so-called LATEX Local Guide, which explains the things that are special to the local system. It should be contained in a file called local.tex. Unfortunately, some lazy sysops do not provide such a document. In this case, go and ask your local LATEX guru for help.
- [6] LATEX3 Project Team. LATEX 2 ϵ for authors. Comes with the LATEX 2 ϵ distribution as usrguide.tex.
- [7] www.wikipedia.com
- [8] <http://www.jaftalks.com/wp/index.php/latex-or-microsoft-word-in-it-organization/>

Thanks for your attention



Your Questions