Technical Writing and Presentation

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Except for the figures created by Matlab, this document has been created by *Free and open source software* (FOSS). Special thanks go to the numerous generous developers behind the following projects:

GNU project free software, mass collaboration project aiming to give users freedom

LaTeX document markup language

TeX Live cross-platform LaTeX distribution

MiKTeX LaTeX distribution for Windows

LyX cross-platform LaTeX-based document preparation system

Beamer LaTeX class for creating presentation slides and handouts

Inkscape cross-platform vector graphics editor

TeX Text Inkscape plugin for creating and editing LaTeX formulae

Other great projects I failed to mention ...

Table of Contents

1 Technical Writing

Word Processors
Usually there are two categories of word processing software packages

- What You See Is What You Get (WYSIWYG)
- What You See Is What You Mean (WYSIWYM)

WYSIWYG	WYSIWYM
Microsoft Word LibreOffice Writer AbiWord Calligra Words	LaTeX LyX

Roughly, you can compare LaTeX to Word as you compare Matlab to Excel

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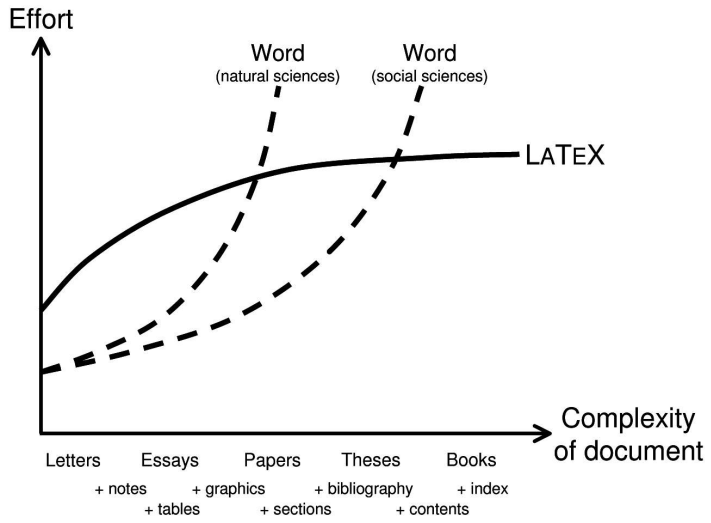
LaTeX vs Microsoft Word



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1.1 LaTeX

LaTeX is a document markup language.

- Simply you can think of it as similar to HTML[1]
- In order to create a document in LaTeX, a **.tex** file must be created using some **text editor**
- The **.tex** file is then **compiled** to produce the document
- LaTeX can generate several document formats including "pdf"

LaTeX is Free

Although being free is an advantage, but it is a drawback at the same time

- Slow download server
- No clean official documentation
- Several alternatives to do the same thing

However; LaTeX is very mature and widely used by professional/enterprise publishers

- Also it has a big user community
  - when you encounter a problem, google it. Most likely you will find others had encountered it and found a solution

[1] (HyperText Markup Language)

LaTeX 2ε Cheat Sheet

Document classes

`book`	Default is two-sided.
`report`	No `\part` divisions.
`article`	No `\part` or `\chapter` divisions.
`letter`	Letter (?).
`slides`	Large sans-serif font.

Used at the very beginning of a document: `\documentclass{`*class*`}`. Use `\begin{document}` to start contents and `\end{document}` to end the document.

Common `documentclass` options

`10pt/11pt/12pt`	Font size.
`letterpaper/a4paper`	Paper size.
`twocolumn`	Use two columns.
`twoside`	Set margins for two-sided.
`landscape`	Landscape orientation. Must use `dvips -t landscape`.
`draft`	Double-space lines.

Usage: `\documentclass[`*opt,opt*`]{`*class*`}`.

Packages

`fullpage`	Use 1 inch margins.
`anysize`	Set margins: `\marginsize{`*l*`}{`*r*`}{`*t*`}{`*b*`}`.
`multicol`	Use *n* columns: `\begin{multicols}{`*n*`}`.
`latexsym`	Use LaTeX symbol font.
`graphicx`	Show image: `\includegraphics[width=`*x*`]{`*file*`}`.
`url`	Insert URL: `\url{`*http://...*`}`.

Use before `\begin{document}`. Usage: `\usepackage{`*package*`}`

Title

`\author{`*text*`}`	Author of document.
`\title{`*text*`}`	Title of document.
`\date{`*text*`}`	Date.

These commands go before `\begin{document}`. The declaration `\maketitle` goes at the top of the document.

Miscellaneous

`\pagestyle{empty}`	Empty header, footer and no page numbers.
`\tableofcontents`	Add a table of contents here.

Document structure

`\part{`*title*`}`
`\chapter{`*title*`}`
`\section{`*title*`}`
`\subsection{`*title*`}`
`\subsubsection{`*title*`}`
`\paragraph{`*title*`}`
`\subparagraph{`*title*`}`

Use `\setcounter{secnumdepth}{`*x*`}` suppresses heading numbers of depth $> x$, where `chapter` has depth 0. Use a `*`, as in `\section*{`*title*`}`, to not number a particular item—these items will also not appear in the table of contents.

Text environments

`\begin{comment}`	Comment (not printed). Requires `verbatim` package.
`\begin{quote}`	Indented quotation block.
`\begin{quotation}`	Like `quote` with indented paragraphs.
`\begin{verse}`	Quotation block for verse.

Lists

`\begin{enumerate}`	Numbered list.
`\begin{itemize}`	Bulleted list.
`\begin{description}`	Description list.
`\item` *text*	Add an item.
`\item[`*x*`]` *text*	Use *x* instead of normal bullet or number. Required for descriptions.

References

`\label{`*marker*`}`	Set a marker for cross-reference, often of the form `\label{sec:item}`.
`\ref{`*marker*`}`	Give section/body number of marker.
`\pageref{`*marker*`}`	Give page number of marker.
`\footnote{`*text*`}`	Print footnote at bottom of page.

Floating bodies

`\begin{table}[`*place*`]`	Add numbered table.
`\begin{figure}[`*place*`]`	Add numbered figure.
`\begin{equation}[`*place*`]`	Add numbered equation.
`\caption{`*text*`}`	Caption for the body.

The *place* is a list valid placements for the body. `t`=top, `h`=here, `b`=bottom, `p`=separate page, `!`=place even if ugly. Captions and label markers should be within the environment.

Text properties

Font face

Command	*Declaration*	*Effect*
`\textrm{`*text*`}`	`{\rmfamily` *text*`}`	Roman family
`\textsf{`*text*`}`	`{\sffamily` *text*`}`	Sans serif family
`\texttt{`*text*`}`	`{\ttfamily` *text*`}`	`Typewriter family`
`\textmd{`*text*`}`	`{\mdseries` *text*`}`	Medium series
`\textbf{`*text*`}`	`{\bfseries` *text*`}`	**Bold series**
`\textup{`*text*`}`	`{\upshape` *text*`}`	Upright shape
`\textit{`*text*`}`	`{\itshape` *text*`}`	*Italic shape*
`\textsl{`*text*`}`	`{\slshape` *text*`}`	*Slanted shape*
`\textsc{`*text*`}`	`{\scshape` *text*`}`	Small Caps shape
`\emph{`*text*`}`	`{\em` *text*`}`	*Emphasized*
`\textnormal{`*text*`}`	`{\normalfont` *text*`}`	Document font
`\underline{`*text*`}`		Underline

The command (*tttt*) form handles spacing better than the declaration (*ttt*) form.

Font size

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

These are declarations and should be used in the form `{\small ...}`, or without braces to affect the entire document.

Verbatim text

`\begin{verbatim}`	Verbatim environment.
`\begin{verbatim*}`	Spaces are shown as ␣.
`\verb!text!`	Text between the delimiting characters (in this case '`!`') is verbatim.

Justification

Environment	*Declaration*
`\begin{center}`	`\centering`
`\begin{flushleft}`	`\raggedright`
`\begin{flushright}`	`\raggedleft`

Miscellaneous

`\linespread{`*x*`}` changes the line spacing by the multiplier *x*.

Text-mode symbols

Symbols

&	`\&`	_	`\_`	...	`\ldots`	•	`\textbullet`
$	`\$`	^	`\^{}`	|	`\textbar`	\	`\textbackslash`
%	`\%`	~	`\~{}`	#	`\#`	§	`\S`

Accents

ò	`\‘o`	ó	`\’o`	ô	`\^o`	õ	`\~o`	ō	`\=o`
ȯ	`\.o`	ö	`\"o`	o̧	`\c o`	ǒ	`\v o`	ő	`\H o`
ç	`\c c`	o̩	`\d o`	o͟	`\b o`	o͡o	`\t oo`	œ	`\oe`
Œ	`\OE`	æ	`\ae`	Æ	`\AE`	å	`\aa`	Å	`\AA`
ø	`\o`	Ø	`\O`	ł	`\l`	Ł	`\L`	ı	`\i`
ȷ	`\j`	¡	`~‘`	¿	`?‘`				

Delimiters

‘	‘	“	‘‘	{	\{	[	[	(	(	<	`\textless`
’	’	”	’’	}	\}	]	]	)	)	>	`\textgreater`

Dashes

Name	*Source*	*Example*	*Usage*
hyphen	`-`	X-ray	In words.
en-dash	`--`	1–5	Between numbers.
em-dash	`---`	Yes—or no?	Punctuation.

Line and page breaks

`\\`	Begin new line without new paragraph.
`\\*`	Prohibit pagebreak after linebreak.
`\kill`	Don't print current line.
`\pagebreak`	Start new page.
`\noindent`	Do not indent current line.

Miscellaneous

`\today`	February 25, 2014.
`$\sim$`	Prints ∼ instead of `\~{}`, which makes ˜.
`~`	Space, disallow linebreak (`W.J.~Clinton`).
`\@.`	Indicate that the `.` ends a sentence when following an uppercase letter.
`\hspace{`*l*`}`	Horizontal space of length *l* (Ex: $l =$ `20pt`).
`\vspace{`*l*`}`	Vertical space of length *l*.
`\rule{`*w*`}{`*h*`}`	Line of width *w* and height *h*.

Tabular environments

`tabbing` environment

`\=` Set tab stop. `\>` Go to tab stop.

Tab stops can be set on "invisible" lines with `\kill` at the end of the line. Normally `\\` is used to separate lines.

tabular environment

```
\begin{array}[pos]{cols}
\begin{tabular}[pos]{cols}
\begin{tabular*}{width}[pos]{cols}
```

tabular column specification

`l`	Left-justified column.
`c`	Centered column.
`r`	Right-justified column.
`p{`*width*`}`	Same as `\parbox[t]{`*width*`}`.
`@{`*decl*`}`	Insert *decl* instead of inter-column space.
`|`	Inserts a vertical line between columns.

tabular elements

`\hline`	Horizontal line between rows.
`\cline{`x`-`y`}`	Horizontal line across columns x through y.
`\multicolumn{`n`}{`*cols*`}{`*text*`}`	A cell that spans n columns, with *cols* column specification.

Math mode

For inline math, use `\(...\)` or `$...$`. For displayed math, use `\[...\]` or `\begin{equation}`.

Superscript^x	`^{x}`	Subscript$_x$	`_{x}`
$\frac{x}{y}$	`\frac{x}{y}`	$\sum_{k=1}^{n}$	`\sum_{k=1}^n`
$\sqrt[n]{x}$	`\sqrt[n]{x}`	$\prod_{k=1}^{n}$	`\prod_{k=1}^n`

Math-mode symbols

$\leq$	`\leq`	$\geq$	`\geq`	$\neq$	`\neq`	$\approx$	`\approx`
$\times$	`\times`	$\div$	`\div`	$\pm$	`\pm`	$\cdot$	`\cdot`
$^\circ$	`^{\circ}`	$\circ$	`\circ`	$\prime$	`\prime`	$\cdots$	`\cdots`
∞	`\infty`	$\neg$	`\neg`	$\wedge$	`\wedge`	$\vee$	`\vee`
$\supset$	`\supset`	$\forall$	`\forall`	$\in$	`\in`	$\rightarrow$	`\rightarrow`
$\subset$	`\subset`	$\exists$	`\exists`	$\notin$	`\notin`	$\Rightarrow$	`\Rightarrow`
$\cup$	`\cup`	$\cap$	`\cap`	$\mid$	`\mid`	$\Leftrightarrow$	`\Leftrightarrow`
$\dot{a}$	`\dot a`	$\hat{a}$	`\hat a`	$\bar{a}$	`\bar a`	$\tilde{a}$	`\tilde a`
α	`\alpha`	β	`\beta`	γ	`\gamma`	δ	`\delta`
ϵ	`\epsilon`	ζ	`\zeta`	η	`\eta`	ε	`\varepsilon`
θ	`\theta`	ι	`\iota`	κ	`\kappa`	ϑ	`\vartheta`
λ	`\lambda`	μ	`\mu`	ν	`\nu`	ξ	`\xi`
π	`\pi`	ρ	`\rho`	σ	`\sigma`	τ	`\tau`
υ	`\upsilon`	ϕ	`\phi`	χ	`\chi`	ψ	`\psi`
ω	`\omega`	Γ	`\Gamma`	Δ	`\Delta`	Θ	`\Theta`
Λ	`\Lambda`	Ξ	`\Xi`	Π	`\Pi`	Σ	`\Sigma`
Υ	`\Upsilon`	Φ	`\Phi`	Ψ	`\Psi`	Ω	`\Omega`

Bibliography and citations

When using BibTeX, you need to run `latex`, `bibtex`, and `latex` twice more to resolve dependencies.

Citation types

`\cite{`*key*`}`	Full author list and year. (Watson and Crick 1953)
`\citeA{`*key*`}`	Full author list. (Watson and Crick)
`\citeN{`*key*`}`	Full author list and year. Watson and Crick (1953)
`\shortcite{`*key*`}`	Abbreviated author list and year. ?
`\shortciteA{`*key*`}`	Abbreviated author list. ?
`\shortciteN{`*key*`}`	Abbreviated author list and year. ?
`\citeyear{`*key*`}`	Cite year only. (1953)

All the above have an `NP` variant without parentheses; Ex. `\citeNP`.

BibTeX entry types

`@article`	Journal or magazine article.
`@book`	Book with publisher.
`@booklet`	Book without publisher.
`@conference`	Article in conference proceedings.
`@inbook`	A part of a book and/or range of pages.
`@incollection`	A part of book with its own title.
`@misc`	If nothing else fits.
`@phdthesis`	PhD. thesis.
`@proceedings`	Proceedings of a conference.
`@techreport`	Tech report, usually numbered in series.
`@unpublished`	Unpublished.

BibTeX fields

`address`	Address of publisher. Not necessary for major publishers.
`author`	Names of authors, of format ....
`booktitle`	Title of book when part of it is cited.
`chapter`	Chapter or section number.
`edition`	Edition of a book.
`editor`	Names of editors.
`institution`	Sponsoring institution of tech. report.
`journal`	Journal name.
`key`	Used for cross ref. when no author.
`month`	Month published. Use 3-letter abbreviation.
`note`	Any additional information.
`number`	Number of journal or magazine.
`organization`	Organization that sponsors a conference.
`pages`	Page range (`2,6,9--12`).
`publisher`	Publisher's name.
`school`	Name of school (for thesis).
`series`	Name of series of books.
`title`	Title of work.
`type`	Type of tech. report, ex. "Research Note".
`volume`	Volume of a journal or book.
`year`	Year of publication.

Not all fields need to be filled. See example below.

Common BibTeX style files

`abbrv`	Standard	`abstract`	`alpha` with abstract
`alpha`	Standard	`apa`	APA
`plain`	Standard	`unsrt`	Unsorted

The LaTeX document should have the following two lines just before `\end{document}`, where `bibfile.bib` is the name of the BibTeX file.

```
\bibliographystyle{plain}
\bibliography{bibfile}
```

BibTeX example

The BibTeX database goes in a file called *file*`.bib`, which is processed with `bibtex file`.

```
@String{N = {Na\-ture}}
@Article{WC:1953,
  author  = {James Watson and Francis Crick},
  title   = {A structure for Deoxyribose Nucleic Acid},
  journal = N,
  volume  = {171},
  pages   = {737},
  year    = 1953
}
```

Sample LaTeX document

```
\documentclass[11pt]{article}
\usepackage{fullpage}
\title{Template}
\author{Name}
\begin{document}
\maketitle

\section{section}
\subsection*{subsection without number}
text \textbf{bold text} text. Some math: $2+2=5$
\subsection{subsection}
text \emph{emphasized text} text. \cite{WC:1953}
discovered the structure of DNA.

A table:
\begin{table}[!th]
\begin{tabular}{|l|c|r|}
\hline
first  &  row  &  data \\
second &  row  &  data \\
\hline
\end{tabular}
\caption{This is the caption}
\label{ex:table}
\end{table}

The table is numbered \ref{ex:table}.
\end{document}
```

LaTeX Editors/IDE

- To write C/C++ code, any text editor can be used
  - But using a good IDE can greatly ease your job
- LaTeX is similar
  - Any text editor is OK, but a dedicated LaTeX editor/IDE is strongly recommended
- A dedicated LaTeX editor/IDE
  - can highlight and auto complete LaTeX keywords
  - has several LaTeX templates for several types of documents
  - facilitates compiling and debugging
  - ...
- Sample LaTeX editors are:

  Texstudio; cross-platform

  Kile; for Linux

  and many others

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Arabic Support

Thanks to the "Arabi"[2] package, Arabic and Farsi languages are supported with the "Babel" package.

- However, since arabic users are few, "Arabi" package is not mature enough and some minor bugs do exist
  - Googling about these bugs, usually you find the same of similar bugs do exist in other languages, and hence you can infer solutions/workarounds

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Keep Concentrating

Due to its WYSIWYM nature, I feel more concentrating while using **LaTeX** as compared to **Ms-Word**.

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Installing LaTeX

- Install LaTeX implementation. Notable implementations are:
  - **MiKTeX** Windows only[3]
  - **TeX Live** cross-platform[4]

[2] Thanks to GOD at first of course

[3] Download the full MiKTeX. This is done using the "**Net Installer**". First, download the full MiKTeX. After download completes, run the downloaded installer and install the full MiKTeX.

[4] Available for MS-Windows, Mac OS and Linux

- Install TEX/LATEX editor/IDE. Notable examples include:
  - **Texstudio** cross-platform[4]
  - **Kile** for Linux
  - ...

Porting LATEX Documents
Usually .tex files often reference other files (images, bibliography databases, ...).

- Hence, if you want to copy a LATEX document to another computer, you have to copy all the referenced files as well

1.2 LYX

LYX is a graphical front-end to LATEX.

- You can think of the LYX-LATEX relationship as similar to the Visual Studio-C++ compiler relationship
- Unlike LATEX, LYX comes with tidy and very good documentation
- Also it has a big community, i.e.,
  - it is mature enough
  - when you encounter a problem, google it. Most likely you will find others had encountered it and found a solution

Keep your concentration
Due to its WYSIWYM nature, I feel very concentrating while using **LYX** as compared to **MsWord**.

Arabic Support
Arabic is supported in LYX.

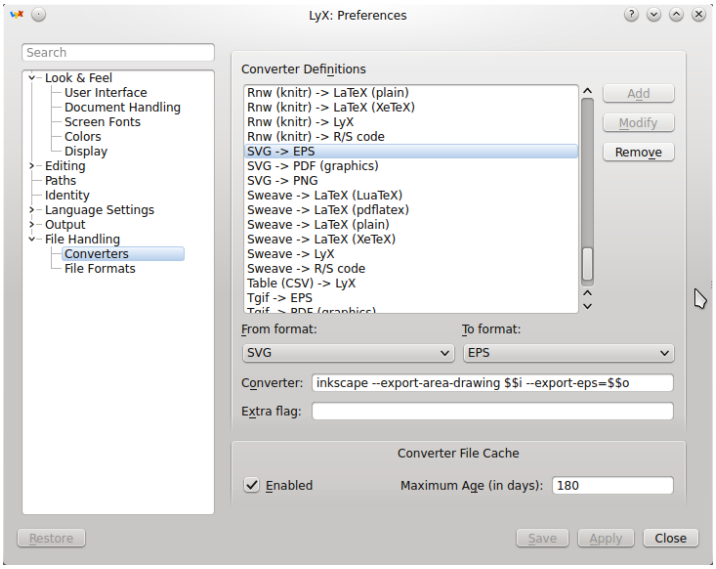
Installing LYX
The following installation sequence is recommended:

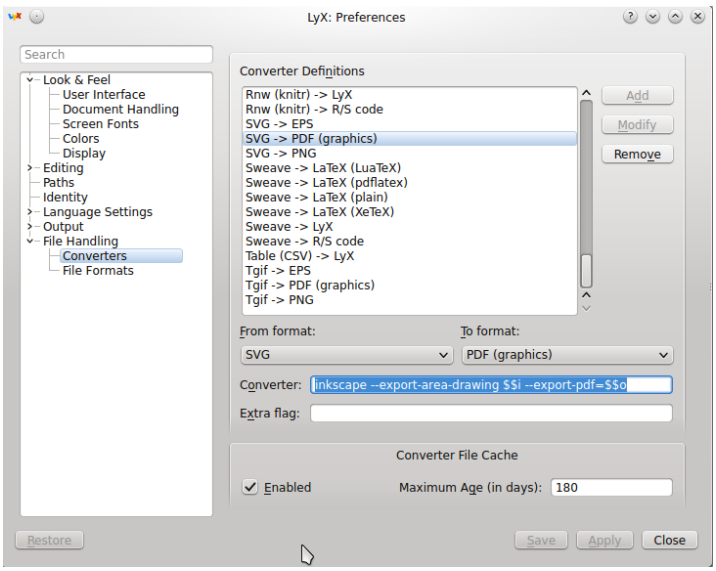
1. Install Inkscape
   - Confirm path to inkscape.exe is added to the "PATH" environment variable
2. Install the ***full*** MiKTEX (or TEX Live)
3. Install LYX

Configuring Converters

SVG is the file format used by the Inkscape graphing SW. Therefore, confirm that LyX uses Inkscape[5] to convert SVG files as follows:

- Tools > Preferences > File Handling > Converters >[6]
  - SVG -> EPS > Converter > inkscape $$i --export-area-drawing --export-type="eps"
  - SVG -> PDF > Converter > inkscape $$i --export-area-drawing --export-type="pdf"
  - SVG -> PNG > Converter > inkscape $$i --export-type="png"
  - GIF -> PNG > Converter > magick convert '$$i[0]' $$o[7]

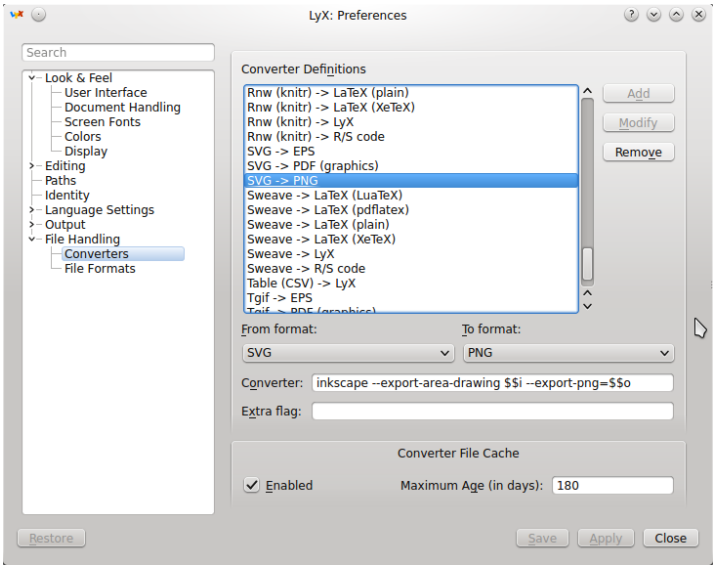




[5]Make sure that the Inkscape is installed, and the path of "inkscape.exe" is added to "path" environment variable. You can test this by executing "inkscape" from the command prompt.

[6]Note that Inkscape CLI has changed since version 1.0 [https://wiki.inkscape.org/wiki/index.php/Using_the_Command_Line#Changes_from_0.92]

[7]For ImageMagick older than release 7.x, use "convert '$$i[0]' $$o"



Learning LyX

- **Explore** style-list, menus and toolbars.
- **Help menu** includes ***very good*** manuals.
  - Manuals themselves are LyX documents
    - So they are essentially very good LyX examples
  - You may begin with:
    - Introduction
    - Tutorial
- **C:\Program Files (x86)\LyX 2.3\Resources** folder contains wide variety of very good examples

Porting LyX Documents

Similar to LaTeX documents, .lyx files often reference other files (images, bibliography databases, ...).

- Hence, if you want to copy a LyX document to another computer, you have to copy all the referenced files as well

1.3 Presentations using Beamer

Beamer is a LaTeX class for creating **professional** presentation slides.

- Beamer can also be easily used within LyX

Presentation Handouts

Beamer-Article is a LaTeX class that renders Beamer slides on a standard sized paper[8] to create ***professional*** presentation handouts.

- Frame titles are used as paragraph titles
- Slide layout/colors are not rendered
- Sectioning is kept
- Beamer-Article can be easily used within LyX

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Keep your concentration

Due to its WYSIWYM nature, I feel very very very concentrating while using **LyX-Beamer** as compared to **Ms-Power Point**.

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Installing Beamer

- Beamer class is usually installed by default with MiKTeX, TeXLive
- Also templates for both Beamer-presentation and Beamer-article are included by default with LyX

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Learning Beamer

- From **LyX**

  Help >Specific Manuals>Beamer Presentations

  Explore the styles list and Insert menu[9]

- **Beamer User Guide** explain creating Beamer presentations in plain LaTeX and LyX as well
- For **customization** of Beamer presentations, check the "BEAMER appearance cheat sheet" at http://science.thilucmic.fr
- For various **themes** of Beamer presentation, check http://www.hartwork.org/beamer-theme-matrix/
- Also a very good variety of presentations are attached to this course

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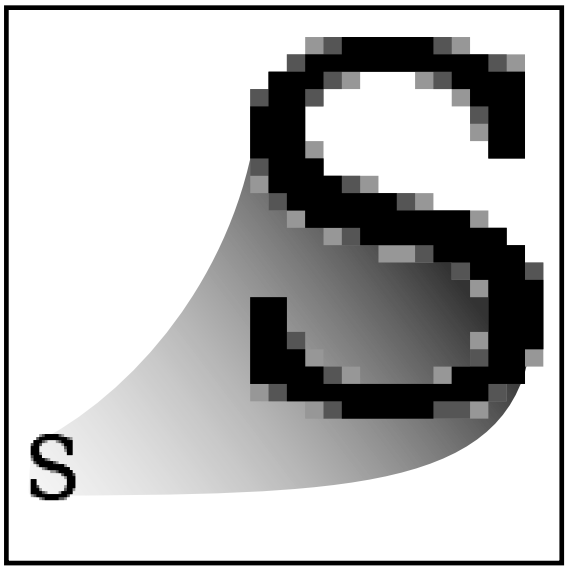
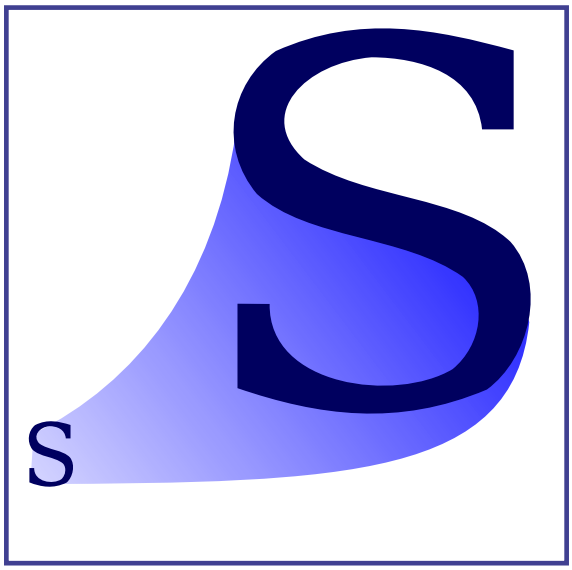
[8] like A4 or letter

[9] Styles will be available after you set the current document type to Beamer. This is done from the menu command "Document>Settings>Document Class>Beamer"

2 Vector Graphics using Inkscape

Raster vs Vector Graphics



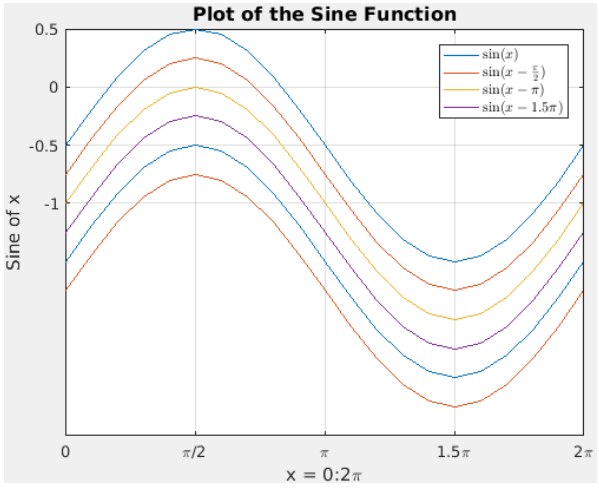


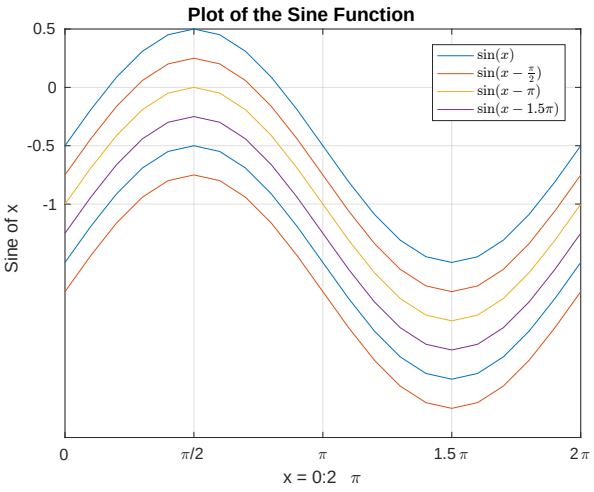
Raster

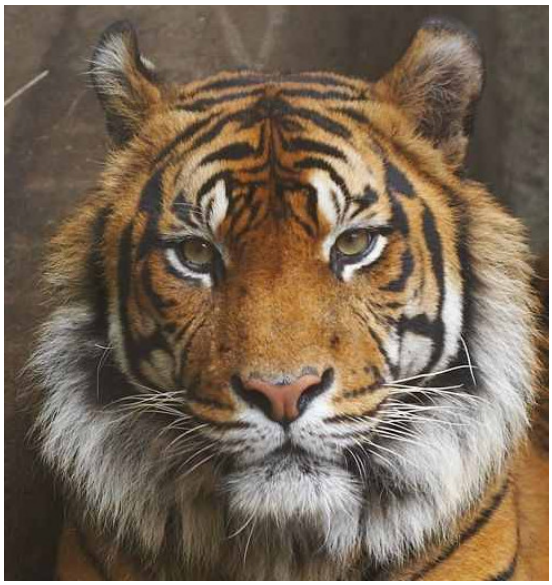
.bmp .jpeg .png

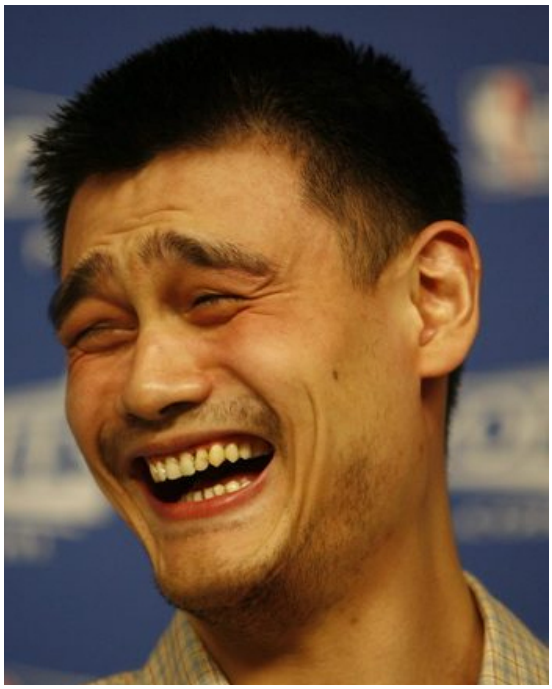
Vector

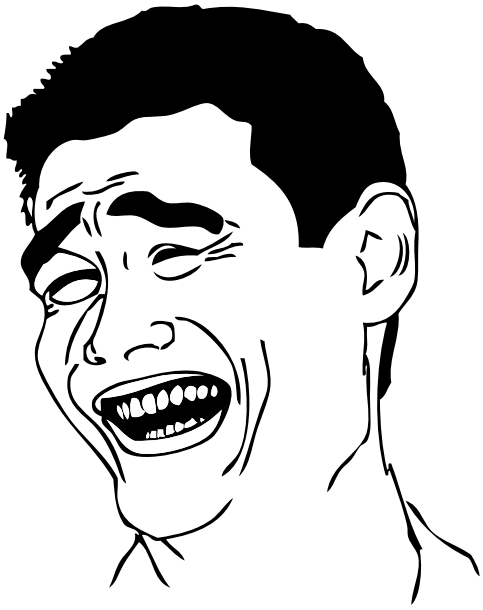
.emf .svg .pdf .eps











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Graphics Formats

Raster		Vector	
.bmp	Uncompressed	.pdf	Compressed
.png	Loose-less compression	.eps	
.jpg	Lossy compression	.emf	Compatible with MS office
		.svg	
⋮		⋮	

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Vector Graphics Editors

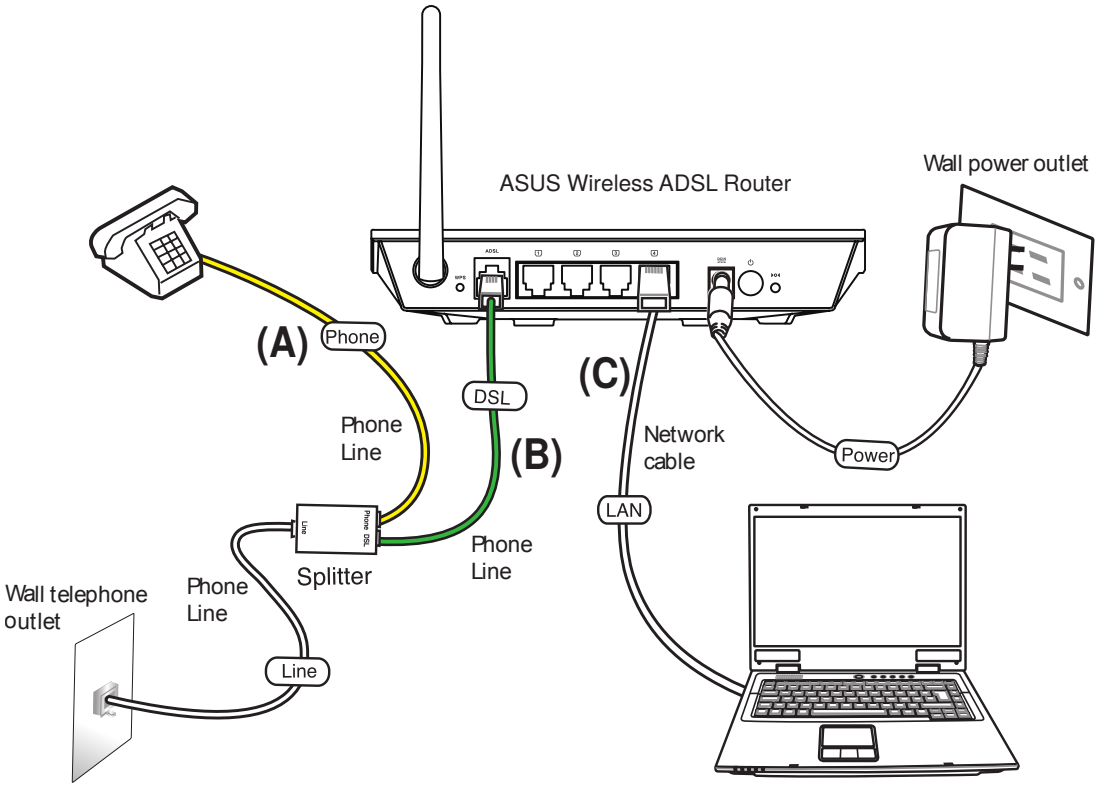
- Adobe Illustrator (*de facto* standard; bloated)
- Corel Draw (bloated)
- Inkscape (light, open source, free, cross-platform and popular; my favorite)
- LibreOffice Draw
- …

- Free
- Open source
- Cross platform
- Has a big community, i.e.,
  - it is mature enough
  - when you encounter a problem, google it. Most likely you will find others had encountered it and found a solution
- Much much powerful than MS-Word or MS-Power point sketching capabilities
- Has several plugins that greatly expand its capabilities

Inkscape Capabilities

- Inkscape is based on brazier curves
  - Defines a curve using four information, **start**, **end**, **start tangent** and **end tangent**
- Additionally, you can draw and edit:
  - straight lines
  - circles/arcs/ellipses
  - text
  - LaTeX formulas
  - function curves
  - …

Import Graphics from pdf

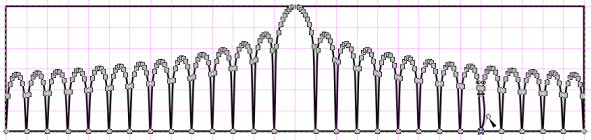


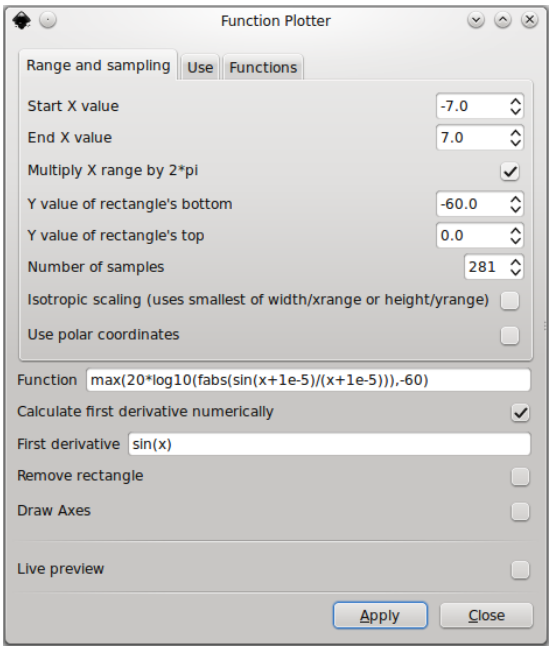
- You can import vector graphics from pdf files, and even edit them

2.1 Interesting Plug-ins

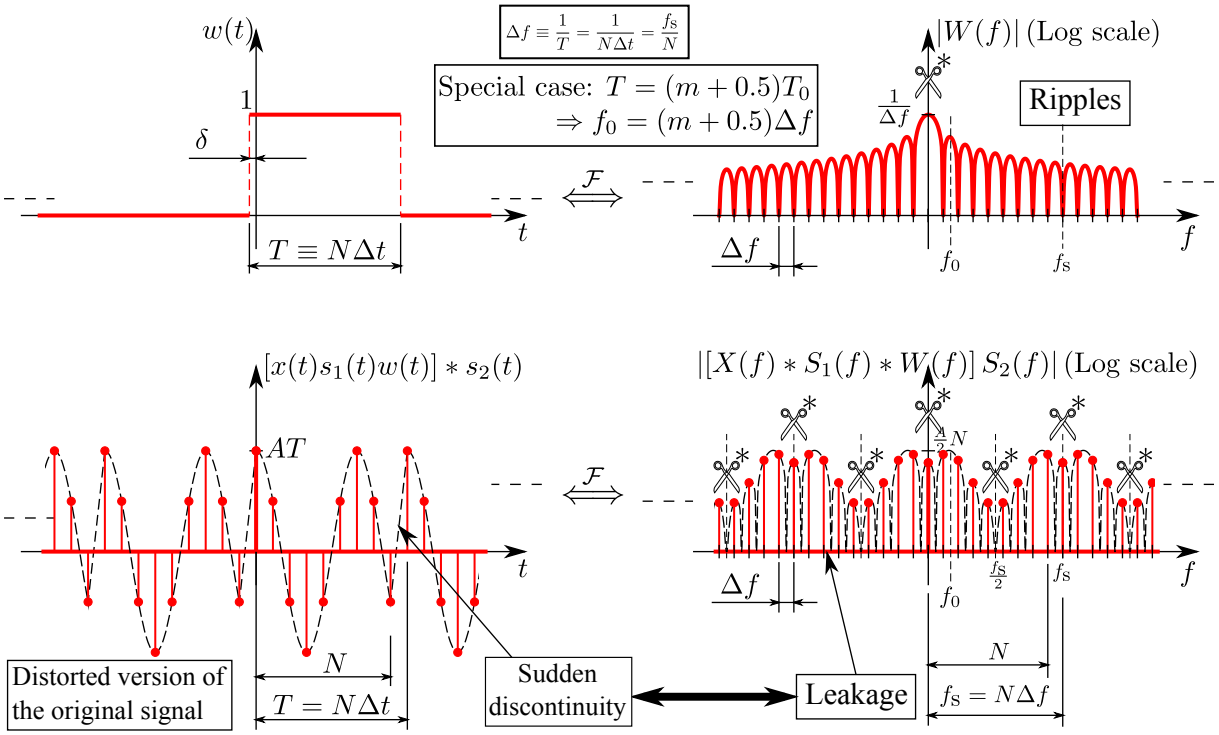
Function Plotter
Function Plotter is a built in plugin.

- It uses Bézier curves, same as Inkscape
- It calculates the function derivative and use it to adjust the curve slope
  - It produces very smooth curves using much less points than Matlab
  - You can still modify the end/control points





TexText
It allows you to write/edit LaTeX formulas inside Inkscape



2.2 Learning Inkscape

- **Explore** menus and toolbars

- **Official manual** [1] is very good and detailed
  - Chapters 1 includes 10 examples
    - The first 3 examples are enough for a good start
  - Chapters 5 explains editing
    - Surf it fast
- **Help menu** includes tutorials, FAQ, ...
- http://inkscapetutorials.org/

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References

[1] T. Bah, *Inkscape*. Prentice Hall, 2011. [Online]. Available: http://www.ebook.de/de/product/14765413/tavmjong_bah_inkscape.html

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