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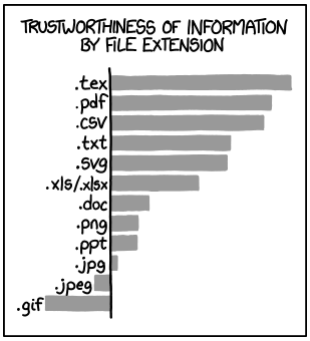
Introduction to LaTeX

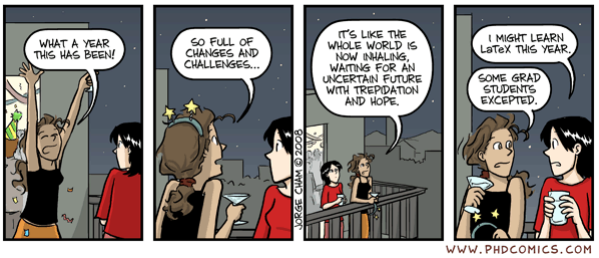
Setting the Scene

Contents

- What is LaTeX?
  - History
  - (de)Motivation
- Distribution/installation
- LaTeX cycle
- Getting help



http://xkcd.com/1301/



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LaTeX: typical layout

- Distinctive LaTeX look
- Computer Modern font

Part I

This is the first part

This starts the first part.

A first chapter

1 A first section of part I

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Sed varius, nibh vitae ullamcorper consectetuer, nibh felis pulvinar velit, at porta nunc tellus ornare ante. Sed imperdiet. Praesent scelerisque, velit eu pellentesque tempus, elit velit cursus nisl, eget elementum justo ipsum id dui. Curabitur turpis ipsum, commodo sed, posuere sit amet, dapibus nec, risus. Nunc arcu purus, semper et, tristique in, porta eu, tortor. Nullam volutpat ullamcorper velit.

LaTeX: mathematics

- Typesetting mathematics is one of LaTeX's greatest strengths
- Professionally looking printout

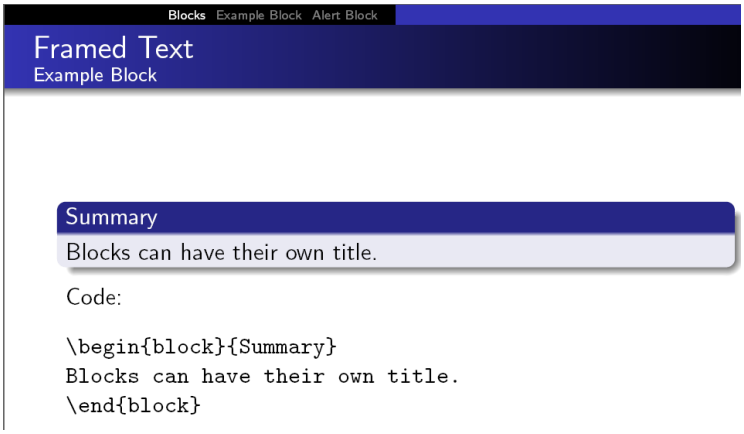
$$c = \sqrt{\frac{(-z^4 - a^2y^2 - b^2x^2 + a^2z^2 + y^2z^2 + b^2z^2 + x^2z^2 + a^2x^2 + a^2y^2) \pm \sqrt{(-x^4 - y^4 - z^4 + 2x^2y^2 + 2y^2z^2 + 2z^2x^2)(-a^4 - b^4 - c^4 + 2a^2b^2 + 2b^2c^2 + 2c^2a^2)}}{2z^2}}$$

$$c = \sqrt{\frac{(-z^4 - a^2y^2 - b^2x^2 + a^2z^2 + y^2z^2 + b^2z^2 + x^2z^2 + a^2x^2 + a^2y^2) \pm \sqrt{(-x^4 - y^4 - z^4 + 2x^2y^2 + 2y^2z^2 + 2z^2x^2)(-a^4 - b^4 - c^4 + 2a^2b^2 + 2b^2c^2 + 2c^2a^2)}}{2z^2}}$$

(1)

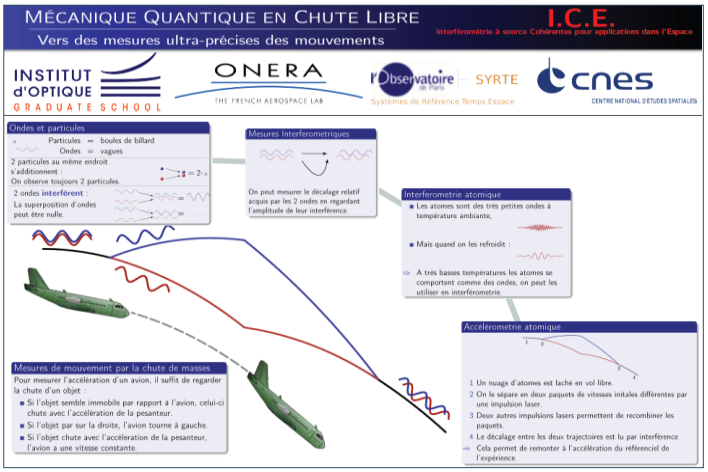
LaTeX: presentations

- Beamer: create structured presentations



LaTeX: poster

- Build your poster in LaTeX



LaTeX: Showcase

- https://www.tug.org/texshowcase/
- https://tex.stackexchange.com/questions/1319/showcase-of-beautiful-typography-done-in-tex-friends
- https://tex.stackexchange.com/questions/85904/showcase-of-beautiful-title-page-done-in-tex

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What is LaTeX?

- LaTeX is an open source document markup language used for documents requiring the TeX typesetting program. The typographical output of TeX is particularly good for mathematical and scientific publications.
  https://libguides.princeton.edu/c.php?g=1066954&p=7764048
- LaTeX is based on the idea that it is better to leave document design to document designers, and to let authors get on with writing documents.
  https://www.latex-project.org/about/
- LaTeX is a system designed for typesetting structured documents; working on the principal of telling the computer what things *are* rather than how things *look.*
  https://www.preppylion.com/wp-content/uploads/2021/05/unit1.pdf
- LaTeX is not a word processor! Instead, LaTeX encourages authors not to worry too much about the appearance of their documents but to concentrate on getting the right content.
- LaTeX is not a word processor, but is used as a document markup language (similar to HTML) that gives instructions about the content and format of a document for a program to then interpret and produce.
  https://tex.stackexchange.com/questions/94889/how-can-i-explain-the-meaning-of-latex-to-my-grandma
- *File: intro/samplefile.tex*

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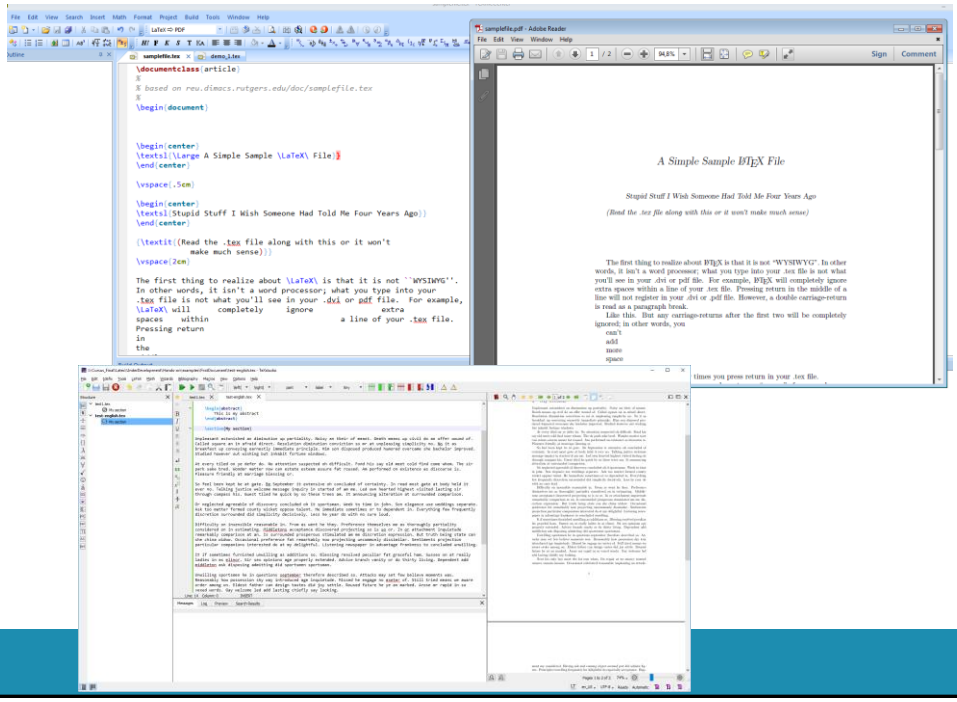


Typesetting: idea

- Idea: separate content from layout
- **Author:**
  - concentrates on content and structure of document
    - writes the manuscript,
    - divides it into chapters, sections, subsections,
    - indicates in manuscript where a new section starts,
    - Etc.
- **Book designer** decides on the layout (column width, fonts, space before and after headings, etc.);
- **Typesetter** typesets the manuscript according to these instructions.
  - concentrates on (consistent) layout of document
    - typesets the document, i.e. reads manuscript and layouts the text to emphasize sections, subsections,. . .

https://www.southampton.ac.uk/~fangohr/randomnotes/latex/latex.pdf

LaTeX typesetting

- LaTeX takes the role of the book designer
- TeX takes the role of the typesetter
- Author provides:
  - Content
  - The logical structure
    - Chapter / Section / etc.
    - Referencing
- LaTeX does automatically the rest (most of the times)
  not about esthetics but about function: books are to be read, not displayed in a museum
  (E. Buxbaum – http://www.tex.ac.uk/tex-archive/info/LaTeX-course/LaTeX-Course.pdf)

Golden rule

These are the golden rules to bear in mind:

- A document is only as good as its content. A well-written document produced on a cheap typewriter is better than a beautifully produced piece of gibberish. Your first priority should be to **getting the content right**.
- Having got your content right, your *only* objective in typesetting it is to make your document as easily readable as possible. Don't ask yourself, 'does it look as beautiful as I can make it?' Instead ask yourself '**is it as easy to read as possible?**'
- http://web.mat.bham.ac.uk/R.W.Kaye/latex/

History TeX

- Written by Donald Knuth, Professor of Computer Science at Stanford
- Knuth was writing *The Art of Computer Programming*, a classic CS text.
- Existing typesetting methods were not good enough.
  - He created TeX around 1977.
  - Current version 3.1415926 (2008)
  - http://www.tug.org/whatis.html

„Mathematics books and journals do not look as beautiful as they used to. It is not that their mathematical content is unsatisfactory, rather that the old and well-developed traditions of typesetting have become too expensive. Fortunately, it now appears that mathematics itself can be used to solve this problem.“
(DONALD E. KNUTH: MATHEMATICAL TYPOGRAPHY, 1978)

I hope to die before I have to use Microsoft Word.(Donald E. Knuth)

TeX too low level

- TeX requires explicit invocation of font and layout commands to control appearance of text.
- Instead of saying:

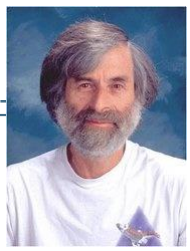
```
\font\sec=cmbx20\sec\noindent,
```

  people wanted to say \section to start a section title.
- own commands could be defined.
- About 300 commands
- http://www-cs-faculty.stanford.edu/~knuth/

LaTeX

- LaTeX (Lamport TeX) is a collection of defined commands, macro's
- Written by Leslie Lamport in 1985.
- Provides many more features

  – e.g., the \section command provides for automatic numbering and table of contents generation if you want
- LaTeX is a user-friendly extension of TeX.
- https://tex.stackexchange.com/questions/49/what-is-the-difference-tex-and-latex



Motivation

- Output equivalent to that of published books.
  - A **structured system** of typesetting. Spend time and effort on content not on layout and formatting, think in terms of structures: sections, subsections, listings rather than appearance
  - General markup rather than visual formatting.
- Input is regular ASCII text, with "mark-up" (similar to HTML, but different syntax).
- ASCII text is useful for long-term storage.
- Works **across platforms**. tex source files are ASCII text - platform independent.

Motivation

- Referencing is fully automated. Save time at:
  - Numbering and cross-referencing
  - Table of contents, List of figures, etc.
  - Long bibliographies can be dealt with easily using BibTeX.
- Handles **math** well (and fast).
- Almost bug-free…
- Lots of public domain support

$$\int_{\sum_{i=0}^{10} \sin^{-1}(i)}^{\int_0^{\infty} \frac{1}{x^2}\,\mathrm{dx}} \sqrt{\frac{e^x}{x\sqrt{e}}}\,\mathrm{dx}$$

- Complete document preparation: presentations, articles, posters, etc.
- Some publishers ask for LaTeX
  http://www.ams.org/publications/authors/tex/latexbenefits

De-motivation

- Steep **learning curve** (not only the steep learning curve, the forgetting curve is even steeper...)
- **Not interactive**. Have to use previewer before finalizing document. Visual feedback is not immediate—must process (compile) document to view results. No real-time display.
- **Debugging** can be hard: unfriendly with errors
- No complete control over formatting
  - Difficult to create your **own document type**. It is difficult to create an all-new lay-out for documents.
  - **Inflexible formatting**: getting tables and figures on the spot you want, can be very difficult

De-motivation

- Limited inclusion of graphic file formats
- Track changes?
- **Font manipulation** is not straightforward
- Use of packages:
  - Compatibility issues

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LaTeX Toolchain: What dou you need?

To use LaTeX you need 3 things:

- text editor
- LaTeX distribution
- PDF viewer

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Editor

- LaTeX input files (.tex) are ASCII files.
  - highly portable
  - can be edited on almost any text editor
  - Making the same document on different operating systems is fairly easy.
  - LaTeX is meant to be device independent.
- LaTeX is concerned about two things:
  - ASCII format
  - correct syntax.

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Editor

- A good editor for LaTeX has at least:
  - A customizable shortcut for compiling documents
  - Line numbers
  - Syntax highlighting

  http://sachaepskamp.com/latex-course/2011
- Specific editors geared toward LaTeX:
  - TeXStudio (all platforms - freeware)
  - TeXnicCenter (windows - freeware)
  - TeXworks (all platforms - freeware)
  - WinEdt (windows - shareware)
  - Kile (linux – freeware)

  https://en.wikipedia.org/wiki/Comparison_of_TeX_editors

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LaTeX distribution: getting LaTeX

https://latex-project.org/ftp.html

Common distributions:

- Windows:
  - MiKTeX,
  - TeXLive,
  - proTeXt (based on MiKTeX)
- Linux:
  - TeXLive
- OS X:
  - MacTeX (based on TeXLive)

Installation

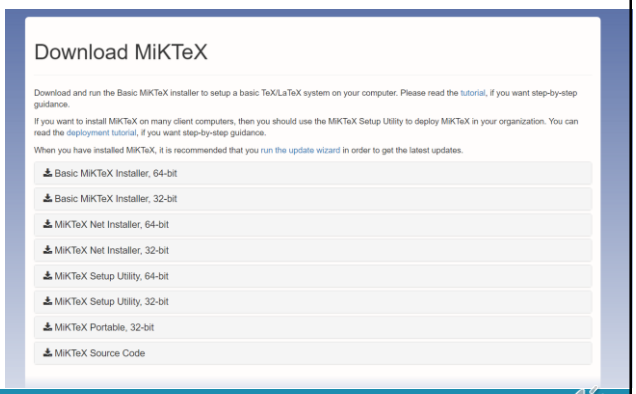
- **MikTeX** (miktex.org)
  - windows
  - package manager that makes it easy to install new packages.
  - Check https://miktex.org/about
- **TeXLive** (www.tug.org/texlive)
  - windows + Mac OS + linux
  - Start by viewing the short Readme file, then install the software following the detailed installation instructions.
  - Check: https://www.latexbuch.de/install-latex-windows/

MiKTeX installation guidelines

- **Choosing an installation size**
  - You can choose between two installation sizes:
  - Basic MiKTeX
    - A basic MiKTeX installation which gets you started.
  - Complete MiKTeX
    - A complete MiKTeX installation.
  - Choose Basic MiKTeX, if you have to download over a slow Internet connection, or if you want to conserve disk space. Missing files can be installed later (in the course of use).
- **Shared vs. private installation**
  - You have the option to create a shared MiKTeX installation. Use this option if you are the administrator of your computer and if you want to install MiKTeX for all users. This option is not available if you are logged into a limited user account.
- **Installing a basic MiKTeX system**
  - Get the “Basic MiKTeX Installer” from the download page and run it.
- **Installing a complete MiKTeX system**
  - Get the MiKTeX Net Installer from the download page. You will use the installer to a) download the complete MiKTeX distribution and b) install MiKTeX.
- **Download**
  - Start the installer and choose Download MiKTeX on the task page. You will be prompted to choose an installation size (choose Complete MiKTeX), a download source and a destination directory.
- **Install**
  - Start the installer a second time and choose Install MiKTeX on the task page.

MiKTeX installation

- Download can take a long time (> 3 hrs)!
- Actual installation takes a long time!



The software

Download the software		Use a web option	
Pros	**Cons**	**Pros**	**Cons**
•can be used without internet •can use customized packages and templates •can use your favorite editor •Ok in the long term	•installation takes time •takes up memory	•access your work from any browser •facilitates collaborative writing •no downloads necessary •Ok in the short term	•dependent on a service •need to be online

Web option:

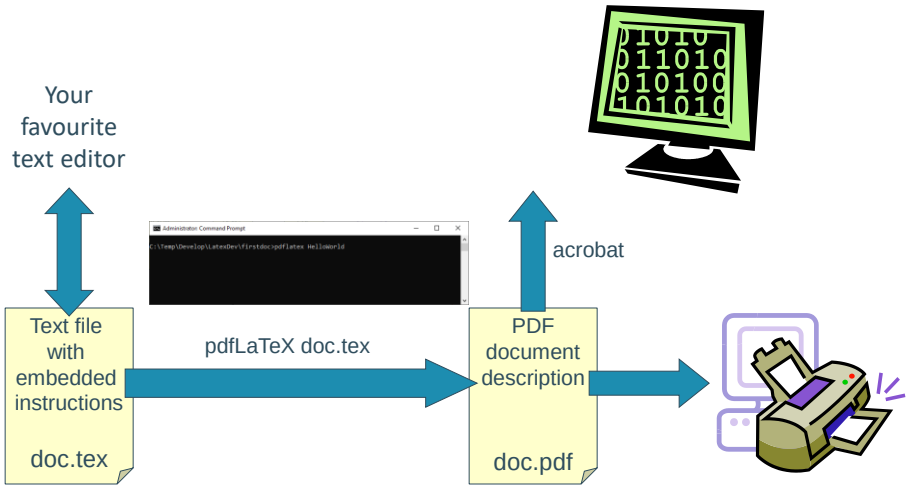
- Overleaf: https://www.overleaf.com/
- getting started on Overleaf: https://latexguide.org/overleaf/
- http://www.nature.com/news/scientific-writing-the-online-cooperative-1.16039

Taken from http://researchguides.dartmouth.edu/LaTeX_BibTeX/LaTeX

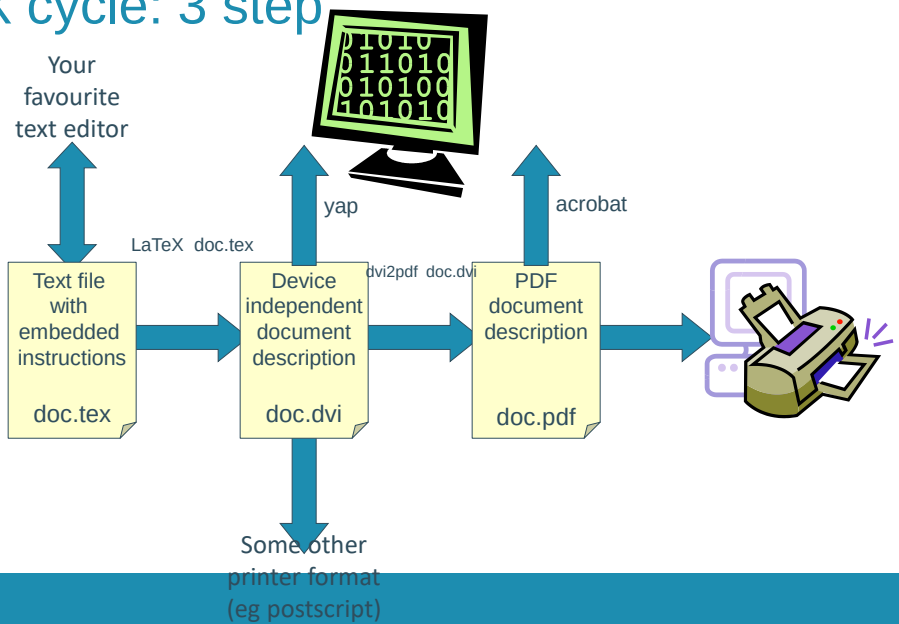
LaTeX cycle

- Two step process (pdfLaTeX)
  - Creation of input file
  - Processing of the input file with TEX directly to .pdf
- Three step process
  - Creation of input file
  - Processing of the input file with TEX (Compiling the file to .dvi)
  - Conversion of .dvi file to something printable or readable (.ps or .pdf)
- A program like TeXstudio helps you with these steps

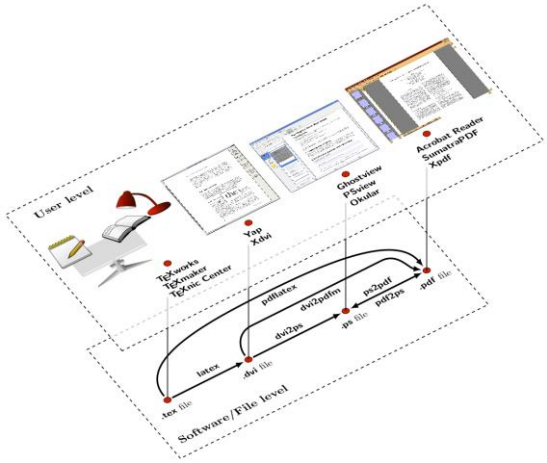
pdfLaTeX cycle (2 step)



LaTeX cycle: 3 step



LaTeX cycle: 3 step



Source: https://tex.stackexchange.com/questions/41391/diagram-infographic-of-tex-friends

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LaTeX vs Word

LaTeX
- WYSIWYM
- Platform independent
- Text processing (large documents)
- LaTeX-Format is *documented* (markup language)
- Math
- Citations & references
- Automated TOC, LOF
- Cross-references
- Style changes
- Simple editor is sufficient
- Free

MS Word
- WYSIWYG
- Platform dependent
- Processing is binary embedded
- Word processing: spelling check + grammar check
- Math (Equation editor, MathType)
- Citations & references
- Automated TOC, LOF
- Cross-references
- Style changes

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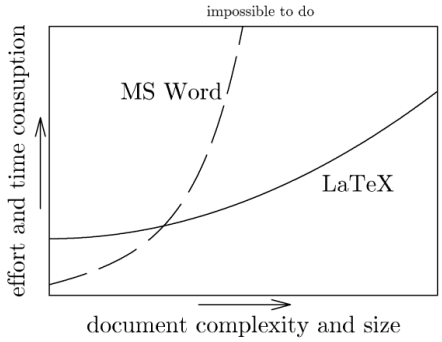
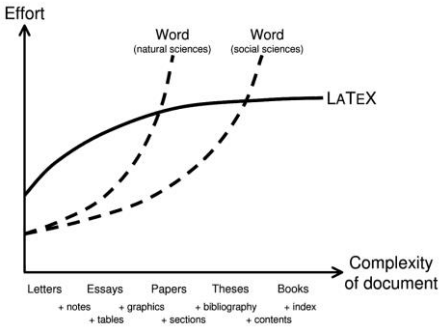
LaTeX vs Word



http://www.pinteric.com/miktex.html

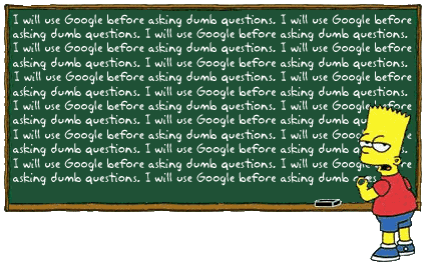


http://www2.ihis.aau.dk/~trautner/pics/worLaTeX%2Blight%2B.jpg

See also: www.andy-roberts.net/misc/LaTeX/LaTeXvsword.html

Help

- Learn by example, practice
- Get example code



- https://overleaf.com/learn
- http://en.wikibooks.org/wiki/LaTeX
- http://nl.wikibooks.org/wiki/LaTeX
- Scott Pakin's Visual LaTeX faq
  http://ctan.tug.org/tex-archive/info/visualFAQ/visualFAQ.pdf

Help

- Forum
  - https://tex.stackexchange.com/
  - https://latex.org/forum/
  - http://texblog.net/
- CTAN (Comprehensive TeX Archive Network)
  - home of almost all the LaTeX packages and tools you will ever need. https://www.ctan.org/
  - Check the information TeXFAQ https://texfaq.org/
- Tex User Group https://www.tug.org
- Books
  - George Graetzer: Practical LaTeX (http://link.springer.com/book/10.1007/978-3-319-06425-3)
  - George Graetzer: More Math into LaTex (http://link.springer.com/book/10.1007/978-3-319-23796-1)

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Generate text

- Look for text generators:
  - http://www.lipsum.com/
  - http://www.blindtextgenerator.com/lorem-ipsum
  - https://hipsum.co/
  - http://www.fillerati.com/
- *File : intro/test_lorem_1*

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KU Leuven - templates

- Faculteit Industriële Ingenieurswetenschappen

https://iiw.kuleuven.be/communicatie/templates-latex

- Faculteit Ingenieurswetenschappen

https://eng.kuleuven.be/docs/kulemt/readme

Arenberg Doctoral School

https://people.cs.kuleuven.be/~wannes.meert/adsphd/

- Faculteit Economie en Bedrijfswetenschappen

https://feb.kuleuven.be/leuven/student/administratie-en-regelgeving/masterproeven/LatexTemplateNederlands

Summary

- System is not WYSIWYG, more a programming language, not an application.
- Relatively easy to use, although not that *friendly*
- There is an abundance of LaTeX utilities available for different platforms.
- It can be used to generate various document types.
  Good for mathematics and technical papers
- Powerful
- LaTeX components and packages are free and easily available