LaTeX

for beginners

Petr Sojka
sojka@fi.muni.cz

Faculty of Informatics
Masaryk University Brno
The Czech Republic

PB029 2019, FI MU, Brno
Outline

Introduction
Getting Acquainted
Getting Started
\LaTeX\ Environments
Fonts and Math
Macros
Designing It Yourself
Moving Information Around
All the Stuff Around
What Is It \TeX? \\

\TeX\ [\text{teck}, \text{\textepsilon}X] is \textit{the} typesetting system developed by Donald Ervin Knuth at Stanford University. \TeX\ sets standard for typesetting in mathematics, science, and engineering. Typographic quality is comparable with the top craft typesetting.

- pronunciation
- history (1977)
- spirit, status
- principles (batch processing)
Getting Acquainted

What Is It $\LaTeX$?

“$\LaTeX$ adds to $\TeX$ a collection of commands that simplify typesetting by letting the user concentrate on the structure of the text rather than on formatting commands. In turning $\TeX$ into $\LaTeX$, I have tried to convert a highly-tuned racing car into a comfortable family sedan. The family sedan isn’t meant to go as fast as a racing car or be as exciting to drive, but it’s comfortable and gets you to the grocery store with no fuss. However, the $\LaTeX$ sedan has all the power of $\TeX$ hidden under its hood, and the more adventurous driver can do everything with it that he can with $\TeX$.”

Leslie Lamport

“$\LaTeX$ is $\TeX$ for intellectuals.”

Philip Taylor
Advantages of \LaTeX

- There is a bunch of predefined \textit{document styles} and page layouts. This allows beginner to prepare documents of professional look.
- Typesetting of math has special support.
- User is supposed to type only several easy understandable markers to specify \textit{logical structure} of document and leaves the rest (typesetting) to \LaTeX.
- Without much effort we may generate complex structures like table of contents, lists of tables, figures, indexes, tables, cross references etc.
- Many publishers offer \LaTeX style files and accept submissions in electronic form as a \LaTeX file.
Disadvantages of \LaTeX

- Slightly higher demands on the computer hardware than with smaller programs for word processing.
- Created documents may be printed only on graphic output devices.
- Predefined layout can be modified by lots of parameters, but radical changes of style files require deep understanding of the system.
Typographic Design

“Typographic design ist a craft, that has to be learnt. Novice authors are making severe typesetting errors. Laymans errorously think that book design is first of all the question of æsthetics—if the document looks well, it is already well ‘designed’. But documents are supposed to be read and not seen in museums—readability and better understanding are more important than appearance.”

Hubert Partl
Typographic Rules

- Paragraphs
- Line length
- Quotation marks
- Choosing of typefaces, fonts
- Ligatures
- Punctuation marks
- Kerning
- Interword spacing
- Emphasizing
\documentclass[options]{style}
%___preamble
\begin{document}%___document_body
This_is_my_first_text_in_LaTeX_(or_rather_\LaTeX). No_worries_about_line_justification._It_doesn't matter_how_many_spaces________you_____________type.

New_paragraph_is_separated_by_one_or_more_blank_lines.__%_this_is_comment
\end{document}

This is my first text in LaTeX (or rather \LaTeX). No worries about line justification. It doesn't matter how many spaces you type. New paragraph is separated by one or more blank lines.
Preparing an Input File

- Local Guide
- Ascii editor
- sample.tex, small.tex
- 0 vs. O, 1 vs. l
- Special characters
  - # $ % & ~ _ ^ \ { } 
- Simple control sequences
- Comments
- Bad habits (underlining)
Special Symbols I.

$ \$ \quad $ dollar sign
& \& \quad ampersand
% \% \quad percent sign
# \# \quad hash mark
_ \_ \quad underscore
{ \{ \quad left curly brace
} \} \quad right curly brace
\sim \quad \sim \quad tilde
\wedge \quad \wedge \quad caret
\backslash \quad $\textbackslash$ \quad backslash
### Special Symbols II.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>LaTeX Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>¶</td>
<td>\textparagraph</td>
<td>paragraph sign (pilcrow)</td>
</tr>
<tr>
<td>§</td>
<td>\S</td>
<td>section number sign</td>
</tr>
<tr>
<td>£</td>
<td>\pounds</td>
<td>pound sign</td>
</tr>
<tr>
<td>‘</td>
<td>\lq</td>
<td>left quote</td>
</tr>
<tr>
<td>′</td>
<td>\rq</td>
<td>right quote</td>
</tr>
<tr>
<td>[[,]</td>
<td>\lbrack[,]</td>
<td>left square bracket</td>
</tr>
<tr>
<td>][,]</td>
<td>\rbrack[,]</td>
<td>right square bracket</td>
</tr>
<tr>
<td>†</td>
<td>\dag</td>
<td>dagger or obelisk</td>
</tr>
<tr>
<td>‡</td>
<td>\ddag</td>
<td>double dagger or diesis</td>
</tr>
<tr>
<td>©</td>
<td>\copyright</td>
<td>copyright sign</td>
</tr>
<tr>
<td>^</td>
<td>\hat{}</td>
<td></td>
</tr>
<tr>
<td>π</td>
<td>\pi</td>
<td></td>
</tr>
<tr>
<td>❤</td>
<td>\heartsuit</td>
<td></td>
</tr>
<tr>
<td>α</td>
<td>\alpha</td>
<td></td>
</tr>
</tbody>
</table>
Simple Text Generating Commands

\TeX \quad \LaTeX
...
\ldots
\cdots
\bullet
2nd October 2019 \today
Today is 2nd October 2019.

(we used macro \today ).

\documentclass[11pt]{article}
\begin{document}
Today is \today .\[2mm]\end{document}
(we used macro \verb*|\today |.)
## Symbols From Those Other Languages I

<table>
<thead>
<tr>
<th>Symbol</th>
<th>LaTeX Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ò</td>
<td>`{o}</td>
<td>o grave</td>
</tr>
<tr>
<td>ô</td>
<td>~{o}</td>
<td>tilde or squiggle</td>
</tr>
<tr>
<td>ó</td>
<td>`{o}</td>
<td>o acute</td>
</tr>
<tr>
<td>ŏ</td>
<td>={o}</td>
<td>bar or macron</td>
</tr>
<tr>
<td>ô</td>
<td>`{o}</td>
<td>o circumflex (hat)</td>
</tr>
<tr>
<td>õ</td>
<td>`{o}</td>
<td>o umlaut or dieresis</td>
</tr>
<tr>
<td>ò̟</td>
<td>u{o}</td>
<td>o breve</td>
</tr>
<tr>
<td>Ő̟</td>
<td>H{o}</td>
<td>double acute (long Hungarian)</td>
</tr>
<tr>
<td>o̟</td>
<td>d{o}</td>
<td>o dot under</td>
</tr>
<tr>
<td>o̟</td>
<td>b{o}</td>
<td>bar under o</td>
</tr>
<tr>
<td>Č̟</td>
<td>v{c}</td>
<td>c caron</td>
</tr>
<tr>
<td>Ž̟</td>
<td>c{c}</td>
<td>c cedilla</td>
</tr>
<tr>
<td>ď̟</td>
<td>.{g}</td>
<td>g dot above</td>
</tr>
<tr>
<td>ò̟̟</td>
<td>t{oo}</td>
<td>oo tie after</td>
</tr>
</tbody>
</table>
Symbols From Those Other Languages II

\begin{verbatim}
ö \oe oe digraph
Œ \OE OE digraph
å \aa a ring
Å \AA A ring
æ \ae ae digraph
Æ \AE AE digraph
ø \o o slash
Ø \O O slash
ł \l polish l
Ł \Ł suppressed L
ß \ss German Es-Zet (sharp S)
i \i dotless i
j \j dotless j
\end{verbatim}
Quotation Marks

‘Convention’ dictates that punctuation go inside quotes, like “this,” but I think it’s better to do “this”. “‘\TeX’ or ‘\LaTeX?’” he asked.

‘Convention’ dictates that punctuation go inside quotes, like ‘‘this,’’ but I think it’s better to do ‘‘this’’. ‘‘\,‘‘\TeX’ or ‘‘\LaTeX?’\,,’’ he asked.
Hyphen, Dash, Emdash, Minus Sign

one-hour lesson, 9–11 am
ano – nebo ne?, yes—or no?
0, 1 and –1

one-hour lesson, 9--11 am
ano-- nebo ne?, yes---or no?
0, 1 and $-1$
Punctuation

\TeX\ (\LaTeX, etc.) are worth learning, IMHO.

\TeX\(\_\)(\LaTeX, etc.)\(\_\)are\_worth\_learning, IMHO\@.

\texttt{\frenchspacing} \texttt{\nonfrenchspacing} ( ? ! )
Preventing Line Breaks

Mr. Major Figure 5
Chapter 2 U. S. Grant
from 1 to 10 (1) gnats
     a clever person
    never hyphenate this

Mr.~Major Figure~5
Chapter~2 U.~S.~Grant
from 1 to~10 (1)~gnats
     a~clever person
\mbox{never hyphenate this}
Emphasizing, Italic Correction

\TeX{} is the typesetting system. *Try it!*

\TeX{} is \textit{the} typesetting system. \textit{Try it!}

You can have \textit{emphasized text} within \textit{emphasized text} too.

You can have \textit{emphasized text}\textit{ within \textit{emphasized text}} too.

You \textit{shouldn’t} do this!

You \textit{shouldn’t} do this!
Footnotes

Karel Čapek\footnote{Famous Czech writer} has invented the word \emph{Robot} in his drama \emph{RUR}\footnote[Rossum’s Universal Robots]{Rossum’s Universal Robots}.

\footnote[num]\footnotemark[num]\footnotetext[num]{text}

\footnote{Famous Czech writer}
\footnotemark[Rossum’s Universal Robots]
Document Styles

- standard $\LaTeX$ (Lamport) [heavily enriched in $\LaTeX$ 3].
  - article for articles in scientific magazines, seminar works
  - report for longer reports, consisting of chapters
  - book for books (parts)
  - letter for letter writing
- supported (journal styles, …) — Local Guide
- unsupported (misc)

$mubeamer$ document class was used for preparation of these slides.
Document Style Options

[10pt], 11pt, 12pt selection of normal size of document fonts

\texttt{fleqn} mathematical equations are aligned to the left instead of centering them

\texttt{leqno} numbering of equations is on the left instead of on the right of every equation

\texttt{titlepage} extra title page with \texttt{article.sty}

\texttt{proc} proceedings option with \texttt{article.sty}

\texttt{twocolumn} option for two column typesetting

\texttt{twoside} twosided document (different typesetting (headers, margins, ...)) when on the left page or on the right one

\texttt{ifthen} option for conditionals

\texttt{makeidx} option for makeindex support

\texttt{bezier} option for bezier curves support
Titlepage I

How to prove
Fermat’s Last Theorem

Andrew Wiles

July 1993

\documentclass[11pt]{article}
\title{How to prove Fermat’s Last Theorem}
\author{Andrew Wiles}
\date{July 1993}

\begin{document}

Petr Sojka • \LaTeX{} for beginners • 2019-09-27
Titlepage II

\begin{titlepage}
\maketitle
\begin{abstract}
...
\end{abstract}
\end{titlepage}

\end{document}
1 Introduction

\LaTeX automatically generates the section number (or not).

About Fermat

Blank lines before or after a sectioning command have no effect.

1.0.1 About Fermat’s “proof”
Basic Sectioning Commands II

\section{Introduction}
\LaTeX\ automatically generates the section number.

\subsection*{About Fermat}
Blank lines before or after a sectioning command have no effect.

\subsubsection{About Fermat’s ‘‘proof’’}
Sectioning Commands

\part \subsection
\chapter \subsubsection
\appendix \paragraph
\section \subparagraph
Fragile Commands

\(( \\) \([ \]\) \begin \end \footnote \verb\any\ * commands\)

\subsection{My \protect\(\%\heartsuit\protect\)\}

1.1 My ♡
Structured Document Input

- \texttt{\textbackslash input}
- \texttt{\textbackslash include}
- \texttt{\textbackslash includeonly}
- \texttt{\textbackslash endinput}
- \texttt{\textbackslash end\{document\} trick}

\texttt{\documentstyle\{seminar\} \\texttt{\textbackslash includeonly\{part2\}} \begin\{document\} \\texttt{\textbackslash include\{part1\}} \\texttt{\textbackslash include\{part2\}} \\texttt{\textbackslash include\{part3\}} \end\{document\}
Dimensions

pt  point
pc  pica (1pc = 12pt)
in  inch (1in = 72.27pt)
bp  big point (72bp = 1in)
cm  centimeter (2.54cm = 1in)
mm  millimeter (10mm = 1cm)
dd  didot point (1157dd = 1238pt)
cc  cicero (1cc = 12dd)
sp  scaled point (65536sp = 1pt)

3_in  29_pc  +42,1_dd  -.01in  0_mm
Glue

- space, stretch, shrink
- natural width
- $<\text{dimen}>$ plus $<\text{dimen}>$ minus $<\text{dimen}>$

10pt plus 5pt minus 2pt
Getting Started

Modes

- **Vertical mode** (building the main vertical list)
- **Internal vertical mode** (building vertical list for an vbox)
- **Horizontal mode** (building a horizontal list for a paragraph)
- **Restricted horizontal mode** (building horizontal list for an hbox)
- **Math mode** (building a mathematical formula to be placed in horizontal list)
- **Display mathematical mode** (building a mathematical formula to be placed on a line by itself, temporarily interrupting the current paragraph)
Boxes

- reference point
- baseline
- height, width, depth

Two lines of type.

\vbox{\hbox{Two lines}\hbox{of type.}}
\rule{1mm}{5mm}
\rule[.1in]{.25in}{.02in}
fbox{this box}
fbox{\rule[-.5cm]{0cm}{1cm}this box}
\hrule \ % \ \vrule
Raising, Lowering, Saving Boxes

You can *raise* or *lower* text. It’s gnats and gnats and gnats, wherever we go.

You can `\raisebox{.6ex}{\em raise}` or `\raisebox{- .6ex}{\em lower}` text. `\vrule\raisebox{.4ex}[1.5ex][.75ex]{\em text}%` `\vrule` `\newsavebox{\toy}` `\savebox{\toy}[.65in]{gnats}` It’s `\usebox{\toy}` and `\usebox{\toy}` and `\usebox{\toy}`, wherever we go.
LR Boxes

There was not a gnu or armadillos in sight.

\begin{flushleft}
\makebox[1in]{\em gnus} are here ... \\
\makebox[1in][l]{\em gnus} are here ... \\
\makebox[1in][r]{\em gnus} are here ... \\
mbox{\em gnus} are here ...
\end{flushleft}
There was not a \textcolor{red}{\framebox[1in][l]{gnu}} or \textcolor{red}{\fbox{armadillos}} in sight.

\begin{flushleft}
\begin{verbatim}
\begin{verbatim}
\begin{verbatim}
\begin{verbatim}
\end{verbatim}
\end{verbatim}
\end{verbatim}
\end{verbatim}
\end{flushleft}
Horizontal Spacing I

Here is 1 in space.
Here is 1 in space.
Here is 1 in space.

Here $\hspace*{1in}$ is 1 in space.
Here $\hspace{1in}$ is 1 in space.
Here $\hspace*{1in}$ is 1 in space.

left right
leftmiddle right

left $\hfill$ right

left $\hfil$ middle $\hfill$ right
Horizontal Spacing II

\, very small space
\enspace as wide as number
\quad as wide as a basefont is high
\qquad twice as wide as \quad
\hfill stretchable space (from 0 to $\infty$)
\hss stretchable and shrinkable space
Vertical Spacing I

Here

is 1 in space.

Here

\vspace*{1in} is 1\,in space.

\vspace{1cm}  
\vspace*{1cm}  
\vspace*{1cm}
Vertical Spacing II

\smallskip \quad about \ \frac{1}{4} \ of \ lineskip
\medskip \quad about \ \frac{1}{2} \ of \ lineskip
\bigskip \quad about \ 1 \ lineskip
\vfill \quad stretchable \ space \ (from \ 0 \ to \ \infty)
\vss \quad stretchable \ and \ shrinkable \ space
Grouping

- Global/local parameters
- Nesting
- Syntax

\{
\}

\begin{environmentname}
\end{environmentname}

\begingroup
\endgroup
Quotation, Quote

From the Time magazine:

\begin{quote}
In 1637 a French lawyer, poet and mathematician Pierre de Fermat wrote in the margin of a book:
\begin{quotation}
“I have found a truly wonderful proof, which this margin is too small to contain.”
\end{quotation}
\end{quote}

From the Time magazine:
\begin{quote}
In 1637 a French lawyer, poet and mathematician Pierre de Fermat wrote in the margin of a book:
\begin{quotation}
‘‘I have found a truly wonderful proof, which this margin is too small to contain.’’
\end{quotation}
\end{quote}
Lists—Itemize

Czechoslovakia has spread into

- The Slovak Republic
- The Czech Republic. It consists of
  - Bohemia
  - Moravia
  - Silesia

Czechoslovakia has spread into
\begin{itemize}
  \item The Slovak Republic
  \item The Czech Republic. It consists of
    \begin{itemize}
      \item Bohemia
      \item Moravia
      \item Silesia
    \end{itemize}
\end{itemize}
Lists—Description

Three animals you should know about are:

\begin{description}
\item [gnat:] A small animal, found in the North Woods, that causes no end of trouble.
\item [gnu:] A large animal, found in crossword puzzles, that causes no end of trouble.
\item [armadillo:] A medium-sized animal, named after a medium-sized Texas city.
\end{description}

Three animals you should know about are:
\begin{description}
\item [gnat:] A small animal, found in the North Woods, that causes no end of trouble.
\item [gnu:] A large animal, found in crossword puzzles, that causes no end of trouble.
\item [armadillo:] A medium-sized animal, named after a medium-sized Texas city.
\end{description}
Lists—Enumerate

1. level one
   1.1 level two
      1.1.1 level three

\begin{enumerate}
\item level one
   \begin{enumerate}
   \item level two
      \begin{enumerate}
      \item level three
      \end{enumerate}
   \end{enumerate}
\end{enumerate}
Between Left and Right

Is there something between Conservative and Labour Party?

Yes.

\begin{center}
Is there something between Conservative and Labour Party?
\end{center}

Yes.
Simulating Typed Text

Command \input{} is very useful.

\begin{verbatim}
Command \verb+\input+ is very useful.
\end{verbatim}

\begin{verbatim*}
\verb*
\begin{verbatim*}

\obeylines
\obeyspaces
\verb*
\begin{verbatim*}
Tabbing Environment

If it’s raining
   then put on boots,
      take hat;
   else smile.
Leave house.

\begin{tabbing}
If \= it’s raining \\ \\ \\
   \> then \= put on boots, \\ \\
   \> \> take hat; \\ \\
   \> \> else \> smile. \\ \\
Leave house.
\end{tabbing}
Tabbing Environment I

Gnat: swatted by: men cows and gnus not very filling
Armadillo: not edible (note also the: aardvark éèé albatross eton)
Gnu: eaten by gnats
\begin{tabbing}
Armadillo: \= \\
Gnat: \> swatted by: \= men \+\+ \\ \\
\> cows \\ \\
\> and \' gnus \- \\ \\
\> not very filling \- \\ \\
Armadillo: \> not edible \\ \\
\pushtabs
(note also the: \= aardvark \a'e\a'e\a=e\\ \\
\> albatross \' eton) \\ \\
\poptabs
Gnu: \> eaten by \> gnats
\end{tabbing}
## Tabular Environment I

<table>
<thead>
<tr>
<th>Year</th>
<th>Price</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>97–245</td>
<td>Bad year for farmers in the west.</td>
</tr>
<tr>
<td>72</td>
<td>245–245</td>
<td>Light trading due to a heavy winter.</td>
</tr>
<tr>
<td>73</td>
<td>245–2001</td>
<td>No gnus was very good gnus this year.</td>
</tr>
</tbody>
</table>
Tabular Environment II

\begin{tabular}{|r||c|p{.4\textwidth}|}
\hline
\multicolumn{3}{|c|}{\textsc{GG\&A Hoofed Stock}} \\
\hline
\multicolumn{1}{|c||}{\textbf{Year}} & \textbf{Price} & \multicolumn{1}{c|}{\textbf{Comments}} \\
\hline
\textit{1971} & 97--245 & Bad year for farmers in the west. \\
\hline
\textit{72} & 245--245 & Light trading due to a heavy winter. \\
\hline
\textit{73} & 245--2001 & No gnus was very good gnus this year. \\
\hline
\end{tabular}
Tabular Parameters

\arraycolsep
\tabcolsep
\arrayrulewidth
\doublerulesep
\arraystretch

\begin{tabular}{\textwidth}[t]
  @{\extracolsep{\fill}}|l|*{3}{r}|%
  p{3cm}@{--}r|}

Petr Sojka  •  \LaTeX\ for beginners  •  2019-09-27 54 / 111
Floats—Figure

In Figure 1 (page 55) you see Czechia.

![Map of Czechia](image)

Figure 1: Map of Czechia

In Figure~\ref{czechia} (page~\pageref{czechia}) you see Czechia.

\begin{figure}[htbp]
\centerline{\framebox{{{\CountriesOfEuropeFamily\EUCountry{136}}}}}
\caption{Map of Czechia}
\label{czechia}
\end{figure}
Tables

Table 1 gives the overview of the presidents of parts of the former Czechoslovakia.

<table>
<thead>
<tr>
<th>State</th>
<th>President</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Czech Republic</td>
<td>V. Havel</td>
</tr>
<tr>
<td>The Slovak Republic</td>
<td>M. Kováč</td>
</tr>
</tbody>
</table>
Table~1 gives the overview of the presidents of parts of the former Czechoslovakia.

```
\begin{table}[tbp]
\caption[Presidents]{Presidents}
\label{presidents}
\begin{tabular}{|l|r|}
\hline
State & President \\
\hline
The Czech Republic: & V. Havel \\
The Slovak Republic: & V. Kováč \\
\hline
\end{tabular}
\end{table}
```
Parameters of Float Placement

\topfraction
\bottomnumber
\bottomfraction
\totalnumber
\textfraction
\floatpagefraction
\dbltopnumber
\dblfloatpagefraction
\floatsep
\textfloatsep
\intextsep
\dblfloatsep
\dbltextfloatsep
\dblfloatsep
\setlength{\unitlength}{1mm} \thicklines
\begin{picture}(130,70)
\put(0,0){\dashbox(130,10){\sf Marriage triangle}}
\multiput(0,15)(5,0){27}{\circle*{1}}
\multiput(0,70)(5,0){27}{\circle*{1}}
\multiput(0,15)(0,5){11}{\circle*{1}}
\multiput(130,15)(0,5){11}{\circle*{1}}
\put(65,25){\oval(60,10)}
\put(65,20){\makebox(0,10){\normalsize\bf John}}
\put(35,35){\line(1,0){60}}
\end{picture}
\put(35,35){\line(1,1){30}}
\put(95,35){\line(-1,1){30}}
\put(65,47){\circle{15}}
\put(65,42){\vector(0,1){10}}
\put(5,55){\framebox(40,10){{\normalsize\bf Mary}}}
\put(85,55){\framebox(40,10){{\normalsize\bf Eve}}}
\end{picture}
Fonts
Basic Concepts

- Shape
- Series
- Size
- Family
- font table, testfont.tex
- NFSS, oldlfont
Fonts

Shapes

\texttt{rm} \quad roman
\texttt{bf} \quad \texttt{boldface}
\texttt{it} \quad \texttt{italic}
\texttt{sl} \quad \texttt{slanted}
\texttt{sf} \quad ‘sans serif’
\texttt{sc} \quad ‘Caps and Small Caps’
\texttt{tt} \quad \texttt{typewriter}
\texttt{boldmath} \quad bold type in math formulæ

\texttt{shape}\{sc\}\texttt{\selectfont}
\texttt{\normalshape}
## Fonts

### Series

<table>
<thead>
<tr>
<th>Weight</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra Light</td>
<td>ul</td>
</tr>
<tr>
<td>Extra Light</td>
<td>el</td>
</tr>
<tr>
<td>Light</td>
<td>l</td>
</tr>
<tr>
<td>Semilight</td>
<td>sl</td>
</tr>
<tr>
<td>Medium (normal)</td>
<td>m</td>
</tr>
<tr>
<td>Semibold</td>
<td>sb</td>
</tr>
<tr>
<td>Bold</td>
<td>b</td>
</tr>
<tr>
<td>Extra Bold</td>
<td>eb</td>
</tr>
<tr>
<td>Ultra Bold</td>
<td>ub</td>
</tr>
<tr>
<td>Ultra Condensed</td>
<td>uc</td>
</tr>
<tr>
<td>Extra Condensed</td>
<td>ec</td>
</tr>
<tr>
<td>Condensed</td>
<td>c</td>
</tr>
<tr>
<td>Semicondensed</td>
<td>sc</td>
</tr>
<tr>
<td>Medium</td>
<td>m</td>
</tr>
<tr>
<td>Semiexpanded</td>
<td>sx</td>
</tr>
<tr>
<td>Expanded</td>
<td>x</td>
</tr>
<tr>
<td>Extra Expanded</td>
<td>ex</td>
</tr>
<tr>
<td>Ultra Expanded</td>
<td>ux</td>
</tr>
</tbody>
</table>

\series{bx}\selectfont
\mediumseries
Fonts and Math

Fonts

Sizing

\tiny \hspace{1cm} \text{tiny}
\scriptsize \hspace{1cm} \text{scriptsize (indexes)}
\footnotesize \hspace{1cm} \text{footnotesize (footnotes)}
\small \hspace{1cm} \text{small}
\normalsize \hspace{1cm} \text{normalsize}
\large \hspace{1cm} \text{large}
\Large \hspace{1cm} \text{Large}
\LARGE \hspace{1cm} \text{LARGE}
\huge \hspace{1cm} \text{huge}
\Huge \hspace{1cm} \text{Huge}

\size{14}{18pt} \selectfont
## Fonts

### Families

<table>
<thead>
<tr>
<th>Font file name</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>cmr10, cmti10, cmsl10,cmcsc10, cmu10,</td>
<td>Computer modern</td>
</tr>
<tr>
<td>cmbx10, cmbxti, cmbxsl, cmb10</td>
<td>roman (cmr)</td>
</tr>
<tr>
<td>cmss10, cmssi10, cmssbx10, cmssdc10</td>
<td>Computer modern sans serif (cmss)</td>
</tr>
<tr>
<td>cmtt10, cmitt10, cmsltt, cmtcsc10</td>
<td>Computer modern typewriter (cmtt)</td>
</tr>
</tbody>
</table>

\renewcommand{$\textfontdefault$}{pstr}
\renewcommand{$\sfdefault$}{pshel}
\renewcommand{$\sldefault$}{it}
Loading Fonts

\newfont{\EUmapf}{CountriesOfEurope scaled 10000 }
\newcommand{\Czechoslovakia}{\EUmapf\symbol{136} and \symbol{162}}
\Czechoslovakia

and
Math in text

For the equation $x^n + y^n = z^n$ where $n$ is an integer greater than 2, there is no solution in positive integers.

For the equation $x^n + y^n = z^n$ where $n$ is an integer greater than $2$, there is no solution in positive integers.

or

For the equation
\[ x^n + y^n = z^n \]
where $(n)$ is an integer greater than $2$, there is no solution in positive integers.
Math Styles

\textstyle
\scriptstyle
\scriptscriptstyle

\frac{\frac{1^1}{2^2}}{\textstyle\frac{1^1}{2^2}}$

\jot
\mathindent
\abovedisplayskip
\belowdisplayskip
\abovedisplayshortskip
\belowdisplayshortskip

$\frac{\frac{1^1}{2^2}}{\textstyle\frac{1^1}{2^2}}$
Math Formulae

On separate line

For the equation

\[ x^n + y^n = z^n \]

where \( n \) is an integer greater than 2, there is no solution in positive integers.

For the equation
\[
\begin{displaymath}
x^n+y^n=z^n
\end{displaymath}
\]

where \((n)\) is an integer greater than 2, there is no solution in positive integers.
Math Symbols

\[ \det_i, \gcd_i, \inf_i, \lim_i, \limsup_i, \max_i, \min_i, \Pr_i, \sup_i \]

\[ a \pmod{b}, a \pmod{10}, \aleph, \forall, \infty, \hbar \]

\[ \emptyset, \exists, \Box, \nabla, \neg, \Diamond, \ldots \]

\[ \text{det}, \text{gcd}, \text{inf}, \text{lim}, \text{lim sup}, \text{max}, \text{min}, \text{Pr}, \text{sup} \]
Numbered Equations

For the equation

$$x^n + y^n = z^n \quad (1)$$

where $n$ is an integer greater than 2, there is no solution in positive integers.

For the equation

\begin{equation}
\begin{aligned}
x^n + y^n &= z^n \\
(\text{n}) &\quad \text{is an integer greater than } 2, \\
\text{there is no solution in positive integers.}
\end{aligned}
\end{equation}
Math Formulæ I

Exponents and indexes

\[ x^5 \quad x_1 \]
\[ x^5 \quad \text{quad} \quad x_1 \]

Square roots

\[ \sqrt{x^2 + \sqrt[3]{y}} \]
\[ \sqrt{x^2 + \sqrt[3]{y}} \]
\[ \texttt{\sqrt{x^2+\sqrt[3]{y}}} \]
Math Formulæ II

Fractions

\[ \frac{1}{x^2+y^2+z^2} \]
\[ \frac{x^2+y^2+z^2}{x+y} \]
\[ \frac{1}{\frac{x^2+y^2+z^2}{x+y}} \]
\[ \frac{\frac{1}{x^2+y^2+z^2}}{\frac{x^2+y^2+z^2}{x+y}} \]

Binomic coefficients

\( \binom{n}{n-k} \)
\( \{n\text{\ choose } \{n-k\}\} \)
Math Formulae III

Integrals

\[ \int_{-\infty}^{\infty} x^3 \, dx \]

\[ \int \limits_{-\infty}^{\infty} x^3 \, dx \]

Sums

\[ \sum_{i=1}^{n} a_i \]

\[ \sum_{i=1}^{n} a_i \]
Math Formulæ IV

Parentheses

\[
\left( (x + 1)(x - 1) \right)^2
\]

\[
\Bigl( (x+1) (x-1) \Bigr)^{2}
\]

\[
\left( (x + 1)(x - 1) \right)^2
\]

\[
\left( (x+1) (x-1) \right)^{2}
\]
Arrays

\[ \mathcal{X} = \begin{pmatrix}
  x_{11} & x_{12} & \ldots \\
  x_{21} & x_{22} & \ldots \\
  \vdots & \vdots & \ddots
\end{pmatrix} \]

\[
\{\mathcal{X}\} = \\
\left( \begin{array}{ccc}
  x_{11} & x_{12} & \ldots \\
  x_{21} & x_{22} & \ldots \\
  \vdots & \vdots & \ddots
\end{array} \right)
\]
Math Formulae VI

System of Equations

\begin{align}
\tag{2}
    f(x) &= \cos x \\
\tag{3}
    f'(x) &= -\sin x \\
    \int_0^x f(y)dy &= \sin x
\end{align}

\begin{eqnarray}
    f(x) & = & \cos x \\
    f'(x) & = & -\sin x \\
    \int_{0}^{x} f(y)dy & = & \sin x
\end{eqnarray}
### Spacing in Math Mode I

<table>
<thead>
<tr>
<th>Name</th>
<th>Command</th>
<th><strong>←Size→</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Double quad</td>
<td>\qquad</td>
<td></td>
</tr>
<tr>
<td>Quad</td>
<td>\quad</td>
<td></td>
</tr>
<tr>
<td>Space</td>
<td>_</td>
<td></td>
</tr>
<tr>
<td>Thick space</td>
<td>;</td>
<td></td>
</tr>
<tr>
<td>Medium space</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Thin space</td>
<td>,</td>
<td></td>
</tr>
<tr>
<td>Negative thin space</td>
<td>!</td>
<td></td>
</tr>
</tbody>
</table>

$\int\int z \, dx \, dy$ vs. $\int\int z dx \, dy$

$\sqrt{2} \, x$ vs. $\sqrt{2} x$

*different* vs. *different*

\[ \int\int z\,dx\,dy \] vs. \[ \int\int z \, dx \, dy \]

\[ \sqrt{2} \, x \] vs. \[ \sqrt{2} x \]

*different* vs. *different*
Math Mode Accents

\hat{a} \quad \check{a} \\
\breve{a} \quad \acute{a} \\
\grave{a} \quad \tilde{a} \\
\bar{a} \quad \vec{a} \\
\dot{a} \quad \ddot{a}

Here are two sizes of wide hat: \[ 1 - x = -y. \]

Here are two sizes of wide hat: \[ \widehat{1-x} = \widehat{-y}. \]

There are no dots in \[ \vec{i} + \vec{j}. \]

There are no dots in \[ \vec{\imath} + \vec{\jmath}. \]
Over- and Underlining

You can have nested overlining: $\overline{x^2 + 1}$.

You can have nested overlining: $\overline{\overline{x^2 + 1}}$.

\[
\underbrace{a + b + \cdots + y + z}_{26}
\]

\[
\underbrace{a + \overbrace{b + \cdots + y}^{24} + z}_{26}
\]
Stacking Symbols

\[ A \xrightarrow{a'} B \xrightarrow{b'} C \stackrel{\text{def}}{=} x_1, \ldots, x_n \]
New Commands—Macros I

1. first item
2. second item
   2.1 first item in second item
   2.2 ...

\newcommand{\be}{\begin{enumerate}}
\newcommand{\ee}{\end{enumerate}}
\be
\item first item
\item second item
  \be
    \item first item in second item
    \item \ldots
  \ee
\ee

It's a bit boring to write \texttt{Popocatepetl} again and again.
\newcommand{\sw}{{\bf Popocatepetl}}
It’s a bit boring to write
\sw\ again and again.
Macros with Parameters

This text will be typeset in *italics*.

\newcommand{\emcorr}[1]{{\em #1\}}
This text will be typeset
in \emcorr{italics}.

Let \( f((a_1,\ldots,a_n),(b_1,\ldots,b_n)) \) be ...:

\newcommand{\fvec}[2]{f((#1_1, \ldots, #1_n),(#2_1, \ldots, #2_n))}
Let \fvec{a}{b} be $\ldots$: 
Simple New Environments

We now have new environment:

- *We use italics.*
- *It’s OK, isn’t it?*

\begin{emphit}
\item We use italics.
\item It’s OK, isn’t it?
\end{emphit}

We now have new environment:

\begin{emphit}
\item We use italics.
\item It’s OK, isn’t it?
\end{emphit}
New Environments with Parameters

We can now define new environment with parameters:

Example: *Environment* quote with emphasized beginning.

\newenvironment{descit}[1]
  {\begin{quote}{\em #1\}/}:
  {\end{quote}}

We can now define new environment with parameters:

\begin{descit}{Example}
Environment {\tt quote} with emphasized beginning.
\end{descit}
New Theorem Environments

Conjuncture (Fermat)

There do not exist integers \( n > 2 \), \( x \), \( y \), and \( z \) such that \( x^n + y^n = z^n \).

\begin{guess}
There do not exist integers \( n>2 \), \( x \), \( y \), and \( z \) such that \( x^n + y^n = z^n \).
\end{guess}
We start this section with one of the basic axiom:

\begin{axiom}
The only thing two \TeX ers can agree on is what the third \TeX er has no need of.\end{axiom}
\newcounter{xx}\newcounter{yy}
def\step(#1,#2){\put(\value{xx},\value{yy}){.}}% 
\addtocounter{xx}{#1}\addtocounter{yy}{#2}
def\1{\step(-1,-1)} \def\2{\step(0,-1)}
def\3{\step(1,-1)} \def\4{\step(-1,0)}
def\6{\step(1,0)} \def\7{\step(-1,1)}
def\8{\step(0,1)} \def\9{\step(1,1)}
\fbox{
\begin{picture}(188,95)
\setcounter{xx}{0}\setcounter{yy}{70}
6\,3\,6\,9\,9\,9\,9\,6\,6\,9\,6\,6\,6\,6\,8
\ldots
8\,9\,8\,8\,7\,7\,4\,7\,7\,8\,7\,8\,7\,8\,8
\end{picture}}
Business Card Example I

RNDr. Petr Sojka, Ph.D.
associate professor

Faculty of Informatics
Masaryk University
Botanická 68a, 602 00 Brno
phone: +420-54949 6966

privat:
Podmostem 15, 635 00 Brno
phone: +420-12345 6789

\newfont{\fnt}{cmssbx10 scaled \magstep 1}
\newcommand{\foren}{\,+420-}
\newcommand{\card}[9]{
  \fboxrule .3mm  \fboxsep 3mm
  \framebox[79mm][l]{
    \vbox{ \footnotesize\rm
      \vskip 8mm
    \vskip 8mm
  \vskip 8mm
  \vskip 8mm
}
\textbf{Business Card Example II}

\makebox[71mm][c]{\normalsize fnt #1} \\
\makebox[71mm][c]{#2} \\
\sf \rule[0mm]{71mm}{0.1mm} \\
\makebox[35mm][l]{#3} \hbox{#7} \\
\makebox[35mm][l]{#4} \hbox{#8} \\
\makebox[35mm][l]{#5} \hbox{#9} \\
\makebox[35mm][l]{#6}

\newcommand{\mycard}{\card{RNDr. Petr Sojka, Ph.D.}{associate professor} \\
{Faculty of Informatics}{Masaryk University} \\
{Botanická 68a, 602\,00 Brno} \\
{phone:\foren 54949,6966} \\
{privat:} \\
{Pod mostem 15, 635\,00 Brno} \\
{phone:\foren 12345,6789}
Macros

Business Card Example III

```latex
\centerline{\mycard}
```
Length Parameters

\setlength{\parindent}{0pt}
\setlength{\parskip}{5pt plus 2pt minus 1pt}
\addtolength{\textwidth}{60pt}
\addtolength{\baselineskip}{0pt plus 0.1pt minus 0.1pt}

Petr
\newlength{\mylength}
\setlength{\mylength}{1cm}
\addtolength{\mylength}{1cm}
\settowidth{\mylength}{Petr}
{{\rm Petr}\hspace*{.5\mylength}}
\hbox{\strut\vrule\hspace*{\mylength}\vrule}
\rule{1cm}{0.4pt}
Counters

\setcounter{page}{0}
\addtocounter{page}{-2}

It was \textcolor{blue}{Gnats} and \textcolor{red}{Gnus} as we trekked through Africa

\begin{minipage}{.7\textwidth}
It was $^{2}$Gnats and $^{3}$Gnus as we trekked through Africa

1 Small insects.
2 Large mammals.
\end{minipage}

\begin{minipage}{.7\textwidth}
It was $^{2}$Gnats and $^{3}$Gnus as we trekked through Africa

\footnotetext{Small insects.}
\footnotetext{Large mammals.}
\end{minipage}
Designing It Yourself

Line Breaking

\linebreak[num]
\nolinebreak[num]
\\[len]
\newline
\-
\hyphenation{words}
\sloppy
\fussy
\begin{sloppypar} pars \end{sloppypar}
Page Breaking

\pagebreak[num]
\nopagebreak[num]
\samepage
\newpage
\clearpage
\cleardoublepage
Page Layout
The wines of France and California may be the best known, but they are not the only fine wines. Spanish wines are often underestimated, and quite old ones may be available at reasonable prices. For Spanish wines the vintage is not so critical, but the climate of the Bordeaux region varies greatly from year to year. Some vintages are not as good as others, so there years ought to be specially noted: 1962, 1964, 1966. 1958, 1959, 1960, 1961, 1964, 1966 are also good California vintages. Good luck finding them!
Numbering

\newcounter{myctr}
\setcounter{myctr}{\value{page}}
\arabic{myctr},
\setcounter{myctr}{2}
\stepcounter{myctr}
\roman{myctr}, \Roman{myctr}
$\fnsymbol{myctr}$,
\addtocounter{myctr}{-1}
\refstepcounter{myctr}
\alph{myctr}, \Alph{myctr}

2, iii, III ‡, b, B
\documentclass[12pt]{letter}
\makelables
\address{My address\\My home, my castle}
\signature{me}
\begin{document}
\begin{letter}{Address}
\opening{Dear ...}
\closing{Best regards}
\cc{ }
\encl{ }
\ps{P.S. }
\end{letter}
\end{document}
Marginal Notes

\marginpar{This is a marginal note}
\marginpar[\$\Rightarrow\$] \{$\Leftarrow\$}

\marginparwidth
\marginparsep
\marginparpush
\reversemarginpar
\normalmarginpar
Structuring a Document

- \tableofcontents
- \listoffigures
- \listoftables
- \nofiles
Titlepage Example I

\LaTeX

PC course

Aston, August 2–5, 1993

Lecturers:

Jiří Zlatuška  Petr Sojka
Masaryk University Brno, The Czech Republic
Titlepage Example II

\clearpage \thispagestyle{empty}
\begin{figure}[p]
\begin{center}{\huge\bf \LaTeX}\[3mm]
{\LARGE\bf PC course}\par\vspace{3mm}
{\normalsize Aston, August 2--5, 1993}
\par\vspace{3mm}
{\footnotesize
\begin{tabular}{c@{}p{1cm}@{}c}
\multicolumn{3}{c}{\bf Lecturers:}\n& \rule{0pt}{5pt} & \\
Ji\v{r}\'\i\v{r} Zlatu\v{s}ka & & Petr Sojka\\
\multicolumn{3}{l}{Masaryk University Brno, The Czech Republic}
\end{tabular}}
\end{center}
\end{figure}
Keyboard Input and Screen Output

\documentclass{article}
\typein[\answer]{Name of your style file (without .sty)}
\makeatletter
  \title{\answer}
  \author{Unknown}
  \input{\answer.sty}
  \typeout{I'll be typesetting using \answer.sty}
\makeatother
\begin{document}
  \maketitle
  ...
\end{document}
The Bibliography I

Definitive guides to \TeX and \LaTeX are \cite{texbook} and \cite{latexbook}.

\begin{thebibliography}{Lamport86}
\bibitem[Lamport86]{latexbook} L. Lamport: A Document Preparation System \LaTeX. Addison-Wesley, 1986.
\end{thebibliography}

Definitive guides to \TeX and \LaTeX are \cite{texbook} and \cite{latexbook}.

\begin{verbatim}
\begin{thebibliography}{Lamport86}
\bibitem[Lamport86]{latexbook} L.~Lamport: \textit{A Document Preparation System \LaTeX}. Addison-Wesley, 1986.
\end{thebibliography}
\end{verbatim}
The Bibliography II

Definitive guides to \TeX{} and \LaTeX{} are [1] and [2].


Definitive guides to \TeX{} and \LaTeX{} are \cite{texbook} and \cite{latexbook}.

\begin{thebibliography}{9}
\bibitem{texbook}
\bibitem{latexbook}
L.~Lamport: \textit{A Document Preparation System \LaTeX{}}. Addison-Wesley, 1986.
\end{thebibliography}
Bibtex

\cite[text]{key_list}
\nocite{key_list}
\bibliography{bib_files}
Index and Glossary

- \index and \glossary commands
- \makeindex, \makeglossary
- theindex environment (defines \item, \subitem, \subsubitem commands)
Figure Insertions

- `graphicx` package with `\includegraphics` command to include external graphics in PDF, PNG, JPEG, (pdf\TeX or Xe\TeX) or EPS (\TeX), `epsf.sty`
- `METAFONT`, `METAPOST`, `mfpic`, `tikz`, `jfig` and many other possibilities
- already obsolete: `bm2font`, `epic.sty`, `eepic.sty`