LaTeX demo file

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Contents

1 Plain LaTeX features

In the following paragraphs some simple LaTeX commands are demonstrated. See the LaTeX books for more information. The LaTeX input is typed between `------` lines in typewriter font.

1.1 Starting LaTeX

On most Unix/Linux computers TeX version 3.14159 (C version 6.1) is available (LaTeX2e). The executables for LaTeXand associated programs must be in your search path. To start LaTeX just type "latex" followed by the LaTeX file name. This file must have the extension **.tex**.

tip : Use in one directory just one **.tex** file eg. **tex.tex** in which you include your LaTeX source files. In this way you will not end up with a huge amount of files, which could easily happen as LaTeX generates a number of output file **tex.xxx** with various extensions.

The **tex** file must always start with some commands which tell LaTeX which *packages* will be used. An example of a **tex.tex** file which would produce the first chapter of this text is :

```
------------------------------------------------------------------------
\documentclass[11pt]{article}
\usepackage{a4wide}
\usepackage{verbatim}

\setlength{\parindent}{0em}

\begin{document}

\tableofcontents

\section{Plain \LaTeX\ features}
\input demtex.txi

\end{document}
------------------------------------------------------------------------
```

The text with the LaTeX commands is in the file *demtex.txi* (The extension .txi is arbitrary). If you use selfmade style files you must place them in a directory where LaTeX can find them.

Headings are made with `sectioning` commands like `\part{ }`, `\chapter{ }`, `\section{ }`, `\subsection{ }`, `\subsubsection{ }`, `\paragraph{ }` and `\subparagraph{ }`. LaTeX automatically generates the section number. Blank lines before or after a sectioning command have no effect. Numbering can be suppressed with eg.

\chapter*{ }

As can be seen we have used the command `\tableofcontents`. This results in the **Contents** which contains the titles of (sub..)sections with their numbers and starting pagenumbers. You can use `\section[contentstitle]{sectiontitle}` to place an alternative for the section title in the contents.

1.2 Paragraphs and line-skips

In this section we show what to do if you want to start a new paragraph or a new line. Also skipping one or more lines is demonstrated. A `blankline` or `\par` starts a new paragraph except before/after sectioning, after `\begin` and before `\end`. A new line is started with `\\` or `\newline`. Using `\\[space]` adds vertical space.
Bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla
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Bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

1.3 "Elastic" spacing

Spaces may be stretched with commands shown in the next LaTeX code :
Here is a stretched space.
Here are two equal ones.
Here is a .... dotfilled space.
Here is a ________________________ rulefilled space.
Here are ____________ two ____________ rulefilled spaces.

Special features are :
Dashes : X-ray, 1–2, dash—like.
Space after a period : Romans et al. wrote I + I = II. Really!
If printed . . . , it is March 1, 2022.
Special characters are typed with \ : # $ % & _ { }
We can prevent the break of the word *doneverbreak*.
We can indicate possible break-points as dopossiblebreakhere.
We can make footnotes [1].

[1] A footnote in LaTeX

1.4 Centering and flushing

LaTeX has a few environments to make the text appear `centered`, `flushleft` and `flushright`
Some examples.
bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

BCE BCE BCE BCE BCE BCE BCE BCE

bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla
bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

BFL BFL BFL BFL BFL BFL BFL BFL BFL BFL

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bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

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BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR

bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

1.5 Itemizing

Some commands for "itemizing" are available and shown below.
bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

- BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT
- BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT

bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla
bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

1. BEN BEN BEN BEN BEN BEN BEN BEN BEN
2. BEN BEN BEN BEN BEN BEN BEN BEN BEN

bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla
bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

label1 BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE

this is label2 BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE

bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

1.6 Font styles and sizes

The following styles are available :

`\rm` roman, `\sf` sans serif, `\sl` *slanted*, `\it` *italic,* `\tt` `typewriter,` `\bf` **bold face,** `\sc` SMALL CAPS, `\em` *emphatic* `\rm` and roman again.
Compare closely *slanted* and *slanted*.
The `\/` command is used to keep any leaning character from bumping against one that doesn't lean.

Every style can be used in different sizes. The size must be changed **before** the type.

Use `\tiny`	to write	abcdefghijABCDEFGHIJ123
Use `\scriptsize`	to write	abcdefghijABCDEFGHIJ123
Use `\footnotesize`	to write	abcdefghijABCDEFGHIJ123
Use `\small`	to write	abcdefghijABCDEFGHIJ123
Use `\normalsize`	to write	abcdefghijABCDEFGHIJ123
Use `\large`	to write	abcdefghijABCDEFGHIJ123
Use `\Large`	to write	abcdefghijABCDEFGHIJ123
Use `\LARGE`	to write	abcdefghijABCDEFGHIJ123
Use `\huge`	to write	abcdefghijABCDEFGHIJ123
Use `\Huge`	to write	abcdefghijABCDEFGHIJ123

1.7 Accents and symbols

In the next table some much used symbols and accents are shown, which can be used in `text` mode. The brackets are not always necessary. The use of `\tabular` will be explained later.

†	`\dag`	‡	`\ddag`	§	`\S`	©	`\copyright`
£	`\pounds`	å	`\aa`	Å	`\AA`	ò	`\‘{o}`
é	`\’{e}`	û	`\^{u}`	ï	`\"{\i}`	ñ	`\~{n}`
ō	`\={o}`	ė	`\e.`	ŏ	`\u{o}`	ě	`\v{e}`

1.8 Boxes

The next LaTeX box-commands are demonstrated in this section.

```
% \framebox[width][hor-pos=lcr]{text}
% \makebox[width][hor-pos=lcr]{text}
% \fbox{text}
% \mbox{text}
% \parbox[ver-pos=bct]{width}{text}
% \begin{minipage}[ver-pos=bct]{width}  text   \end{minipage}
```

```
% \raisebox{len-above-base}[heigth][dept]{text}
% \rule{len-above-base}{x-length}{y-length}
```

Good *gnus* are here. Good *gnus* are here.
Good *gnus* are here. Good *gnus* are here.
Good *gnus* are here. Good *gnus* are here.

Rule 1 : ; Rule 2 : ; Rule 3 :

Compare this box with this box.

You can *raise* or *lower* text. You can also raise a box :

Now we demonstrate the use of `\parbox` and `\minipage`, which are essentially the same, except that the `\minipage` is an environment.

This is a parbox aligned on its top line. and this one is alligned on its bottom line.

The next parbox is alligned on its top line and this is also framed again

This is a minipage alligned on its top line and This is a minipage with a footnote [a] which is placed in the minipage.

[a] This is the footnote

1.9 Tabular

The `tabular` environment is used very much. It is explained and demonstrated below.
A 'fixed' column can be made with `@{text}` in the tabular specification. Using `@{}` sets the column separation to zero. It will often be very convenient to define a column as a `parbox` with `p{width}` in the tabular specification.

bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

first column	second column	third column	fourth column	fifth column

bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla
bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

first first	second second second second	third third third third
first first	second second second second	third third third third

bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

2 Math in LaTeX

2.1 General remarks

LaTeX uses the following four math styles when typesetting formulas :

- **display**style	For normal symbols in a displayed formula.
- **text**style	For normal symbols in an in-text formula.
- **script**style	For subscripts and superscripts.
- **scriptscript**style	For further levels of sub- and superscripting.

They can be defined locally in a math environment.

In math mode LaTeX ignores spaces. There are commands to add the amount of horizontal space. These are `\.` for a thin space, `\:` for a medium space, `\;` for a thick space and `\!` for a negative thin space.
Examples :

$$\sqrt{2}\,x \quad \text{instead of} \quad \sqrt{2}x$$

$$n/\log n \quad \text{instead of} \quad n/\log n$$

$$\iint z\,dx\,dx \quad \text{instead of} \quad \int\int zdxdy$$

2.2 symbols and accents

In the next table some much used LaTeX commands for symbols are shown. The commands must be placed in a `math` environment.

$\div$	`\div`	$\pm$	`\pm`	$*$	`\ast`
$\star$	`\star`	$\leq$	`\leq`	$\geq$	`\geq`
$\equiv$	`\equiv`	$\neq$	`\neq`	$\ll$	`\ll`
$\gg$	`\gg`	$\subset$	`\subset`	$\emptyset$	`\emptyset`
$\cap$	`\cap`	$\cup$	`\cup`	$\in$	`\in`
$\imath$	`\imath`	$\jmath$	`\jmath`	$\forall$	`\forall`
∞	`\infty`	$\exists$	`\exists`	∇	`\nabla`

There are some variable-sized symbols like :

$\sum$	`\sum`	$\int$	`\int`	$\oint$	`\oint`

Some Log-like functions are typed in text-fonts in a mathematical environment by preceeding their names with `\` (eg. `\log`). LaTeX defines the following functions :

arccos	cos	csc	exp	ker	lim sup	min	sinh
arcsin	cosh	deg	gcd	lg	ln	Pr	sup
arctan	cot	det	hom	lim	log	sec	tan
arg	coth	dim	inf	lim inf	max	sin	tanh

There are much more features available which can be found in the LaTeX books.

2.3 Examples

$$r = r_0 + \alpha(T - T_0)$$

$$\frac{1}{\rho} - \frac{1}{r} = \frac{\omega}{u \sin\theta}$$

$$\alpha = \frac{\omega_f - \omega_0}{t}$$

$$f_0 = \frac{1}{2\pi\sqrt{LC}}$$

$$\nu_{rms} = \sqrt{\frac{3kT}{m_0}}$$

$$\frac{3\sin\phi}{2+\cos\phi} = \phi - \tfrac{1}{180}\phi^5 + O(\phi^7) \qquad (\phi \to 0)$$

$$\mathrm{tg}15^o = 2 - \sqrt{3}$$

$$e^x = \lim_{n\to\infty}\left(1 + \frac{x}{n}\right)^n$$

$$C = \begin{bmatrix} 0 & \kappa & 0 \\ -\kappa & 0 & \tau \\ 0 & -\tau & 0 \end{bmatrix}$$

$$k_W = [H^+] \times [OH^-] \approx 10^{-14} \qquad \text{of} \qquad k_W = [\mathrm{H}^+] \times [\mathrm{OH}^-] \approx 10^{-14}$$

$$f(x) = \tfrac{1}{2\pi}\int_{-\infty}^{+\infty} e^{-itx}\Phi(t)\,dt$$

$$\sum_{j=0}^{n} \binom{n}{j} \frac{(-1)^j}{m+j} = \frac{1}{m\binom{m+n}{n}} \qquad (n \geq 0, m \geq 1)$$

$$f(x) = \begin{cases} 0 & \text{als} \quad x \leq 0 \\ \frac{b^n}{\Gamma(p)} x^{p-1} e^{-bx} & \text{als} \quad x > 0 \end{cases} \qquad \text{of} \qquad f(x) = \begin{cases} 0 & \text{als} \quad x \leq 0 \\ \dfrac{b^n}{\Gamma(p)} x^{p-1} e^{-bx} & \text{als} \quad x > 0 \end{cases}$$

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}$$

$${}^{55}_{25}Mn + {}^{2}_{1}H \ \rightarrow \ {}^{55}_{26}Fe + 2\,{}^{1}_{0}n \qquad \text{of} \qquad {}^{55}_{25}\mathrm{Mn} + {}^{2}_{1}\mathrm{H} \ \rightarrow \ {}^{55}_{26}\mathrm{Fe} + 2\,{}^{1}_{0}n$$

$$\frac{d}{dt}\frac{\partial L}{\partial \dot{q}_k} - \frac{\partial L}{\partial q_k} = \alpha_k$$

$$\begin{aligned} Ei(x) &= \int_{-\infty}^{x} \frac{e^u}{u}\, du \\ &= \gamma + \ln x + \frac{x}{1 \cdot 1!} + \frac{x^2}{2 \cdot 2!} + \frac{x^3}{3 \cdot 3!} + \cdots \\ &\sim \frac{e^x}{x}\left[1 + \frac{1!}{x} + \frac{2!}{x^2} + \frac{3!}{x^3} + \cdots\right] \qquad (x \to \infty) \end{aligned}$$

$$-\frac{h^2}{8\pi^2 m}\frac{\partial^2 \Psi(x,t)}{\partial x^2} + V(x)\Psi(x,t) = -\frac{h}{2\pi i}\frac{\partial \Psi(x,t)}{\partial t} \qquad \text{(E. Schrödinger, 1926)}$$

3 Bibliography

BibTex is a TEX program which can be used to put references to bibliography in your source text. Refering to references is done with the command *cite*{*reference-key*}, as is demonstrated in the next subsections.

3.1 Bibliography in-line

In this example we want to demonstrate the use of BibTeX where references are included in-line. Citation can be done with `\cite`. Examples : [1, 2].
To ensure that the references are correct, we must run latex two times.

With the command *addcontentsline* the **Reference** is included in the table-of-contents.

References

[1] Barenblatt, G.I. *The mathematical theory of equilibrium cracks in brittle fracture*. Advances in Applied Mechanics, Vol 7, 1962, pp 55-129.

[2] Barsoum, R.S. *On the use of isoparametric Finite Elements in Linear Fracture Mechanics*. Int. J. Numerical Methods in Engineering, Vol 10, 1976.

[3] Broek, D. *Elementary engineering fracture mechanics; 4thed.*. Martinus Nijhoff Publishers, 1986.

3.2 Bibliography in separate file

Bibliographic data can also be placed in a separate file, which has the extension *.bib*. The example is more or less copied from the book of Goossens [Goossens(1994)]. We can cite articles written by a single author [Filici(1991)] and by multiple authors [Mittelbach and Schöpf(1990)]

Here we use the file *bibdem.bib*. The structure of such a database file can be found elsewhere. The **Reference** section with the bibliographic data, is included with the command *bibliography*. The layout of this section is defined in a package, with the extension *.bbs*. This file must be "loaded" with the command *bibliographystyle*, preceeding *bibliography*. Here we use the plain LATEX style, which is defined in the package *plainnat.bbs*.

To ensure that the references are correct, the following sequence of commands must be given:

latex	tex-file	loads the desired *.bbs* style file
bibtex	tex-file	processes the *.bib* file
latex	tex-file	generates the correct references

References

[Filici(1991)] James Filici. Postscript versus truetype. *Macworld*, 8:195–201, September 1991.

[Goossens(1994)] Michel Goossens. *The LaTeXCompanion*. Addison-Wesley Publishing Company, Reading, Massachusetts, 1994.

[Mittelbach and Schöpf(1990)] Frank Mittelbach and Rainer Schöpf. The New Font Selection — User Interfaces to Standard LaTeX. *TUGboat*, 11(2):297–306, 1990.

A First appendix

[redacted]

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B Second appendix

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