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 the computer network of WFW TeX version 3.14159 (C version 6.1) is available (LaTeX2e). To run this version your path has to include : "/software/tex/teTeX/bin/mips-irix5.3". 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 produced 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 \verb.blankline. or \verb.\par. starts a new paragraph except
before/after sectioning,
after \verb.\begin. and
before \verb.\end..
A new line is started with \verb.\\. or \verb.\newline..
Using \verb.\\[space]. adds vertical space.
-----------------------------------------------------------------------
```

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

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
bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla
\par
Bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla
\setlength{\parindent}{10em}
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
bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla
\setlength{\parindent}{0em}
\par
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 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

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
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
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
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 \hfill      stretched space.\\
Here are  \hfill      two \hfill equal ones.\\
Here is a \dotfill\   dotfilled space.\\
Here is a \hrulefill\ rulefilled space.\\
Here are  \hrulefill\ two \hrulefill rulefilled spaces.
-----------------------------------------------------------------------
```

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 \ldots, it is \today. \\
Special characters are typed with \verb.\. \ \ :
\# \$ \% \& \_ \{ \}  \\
We can prevent the break of the word \mbox{\em doneverbreak}.\\
We can indicate possibel break-points as do\-pos\-sible\-break\-here.\\
We can make footnotes \footnote{A footnote in \LaTeX\.}.\\
-----------------------------------------------------------------------
```

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 February 7, 2000.
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 bla
\begin{center}
BCE BCE BCE BCE BCE BCE BCE BCE
\end{center}
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

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
\begin{flushleft}
BFL BFL BFL BFL BFL BFL BFL BFL BFL BFL
\end{flushleft}
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

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
\begin{flushright}
BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR
BFR BFR BFR BFR BFR BFR BFR BFR BFR
\end{flushright}
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

BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR BFR 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
\begin{itemize}
\item
BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT BIT
\item
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
\end{itemize}
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

- 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 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
\begin{enumerate}
\item
BEN BEN BEN BEN BEN BEN BEN BEN BEN
\item
BEN BEN BEN BEN BEN BEN BEN BEN BEN
\end{enumerate}
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
\begin{description}
\item[label1]
BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE
\item[this is label2]
BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE
\end{description}
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 BDE BDE BDE

this is label2 BDE BDE BDE BDE BDE BDE BDE BDE BDE BDE 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~:\\

\verb.\rm. \rm  roman,
\verb.\sf. \sf  sans serif,
\verb.\sl. \sl  slanted,
\verb.\it. \it  italic,
\verb.\tt. \tt  typewriter,
\verb.\bf. \bf  bold face,
\verb.\sc. \sc  small caps,
\verb.\em. \em  emphatic
\verb.\rm. \rm  and roman again.
-----------------------------------------------------------------------
```

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 {\sl slanted\/} and {\it slanted}.\\
The \verb+\/+ command is used to keep any leaning character from
bumping against one that doesn't lean.
-----------------------------------------------------------------------
```

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 \verb.text. mode.
The brackets are not always necessary.
The use of \verb.\tabular. will be explained later.
\\

\begin{tabular}{||*{8}{l|l||}}
\hline
\dag         & \verb.\dag.         &
\ddag        & \verb.\ddag.        &
\S           & \verb.\S.           &
\copyright   & \verb.\copyright.   \\
\pounds      & \verb.\pounds.      &
\aa          & \verb.\aa.          &
\AA          & \verb.\AA.          &
\‘{o}        & \verb.\‘{o}.        \\
\’{e}        & \verb.\’{e}.        &
\^{u}        & \verb.\^{u}.        &
\"{\i}       & \verb.\"{\i}.       &
\~{n}        & \verb.\~{n}.        \\
\={o}        & \verb.\={o}.        &
\.{e}        & \verb.\.{e}.        &
\u{o}        & \verb.\u{o}.        &
\v{e}        & \verb.\v{e}.        \\
\hline
\end{tabular}\\
-------------------------------------------------------------------------
```

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 \makebox[1in]    {\em gnus} are here.
Good \makebox[2cm][l] {\em gnus} are here.\\
Good \framebox[1in]   {\em gnus} are here.
Good \fbox            {\em gnus} are here.\\
Good \raisebox{.6ex}  {\em gnus} are here.
Good \raisebox{-.6ex} {\em gnus} are here.
-----------------------------------------------------------------------
```

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{1mm}{5mm} ;
Rule 2 : \rule{5mm}{0.5mm} ;
Rule 3 : \rule[0.1in]{5mm}{0.5mm}\\
Compare \fbox{this box} with \fbox{\rule[-.5cm]{0cm}{1cm} this box}.\\
You can \raisebox{.6ex}{\em raise} or \raisebox{-.6ex}{\em lower} text.
You can also raise a box :
\raisebox{0.7ex}{\framebox[5ex]{\rule[0ex]{0cm}{0.7ex}}}
-----------------------------------------------------------------------
```

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.

```
\parbox[t]{1in}
{This is a parbox aligned on its top line.}
\ and this \
\parbox[b]{1in}
{one is alligned on its bottom line.}\\
```

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

```
The next parbox
\parbox[t]{4cm}{is alligned on its top line again}
\ and this \
\framebox{\parbox[t]{3cm}{is also framed}}
\\
```

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

```
\begin{minipage}[t]{1in}
This is a minipage alligned on its top line
\end{minipage}
\ and \
\begin{minipage}[t]{1in}
This is a minipage with a footnote
\footnote{This is the footnote} which is placed in the minipage.
\end{minipage}
```

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 bla

\begin{tabular}{ccllr}
first & second & third & fourth & fifth \\
column & column & column & column & column \\
\end{tabular}

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 bla bla

first	second	third	fourth	fifth
column	column	column	column	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 bla bla
\\

\begin{tabular}{@{}p{5cm}@{}p{3cm}@{\hspace{1cm}}p{6cm}}
first first & second second second second & third third third third \\
first first & second second second second & third third third third \\
\end{tabular}

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 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 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 :

```
-----------------------------------------------------------------------
\[ \sqrt{2} \, x           \mbox{\ \ instead of\ \ } \sqrt{2}x \]
\[ n / \! \log n           \mbox{\ \ instead of\ \ } n/\log n \]
\[ \int\!\!\int z\,dx\,dx  \mbox{\ \ instead of\ \ } \int\int z dx dy \]
-----------------------------------------------------------------------
```

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

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

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

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

```
\[
   r = r_0 + \alpha ( T - T_0 )
\]

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

\[
   \alpha
   = \frac{\omega_f - \omega_0}{t}
\]

\[
   f_0
   = \frac{1}{2 \pi \sqrt{LC} }
\]


\[
   \nu_{rms}
   = \sqrt{ \frac{3 k T}{m_0} }
\]
```

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

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

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

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

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

```
\[
   \frac{3 \sin \phi}{2 + \cos \phi}
   =
   \phi - {\textstyle \frac{1}{180}} \phi^5 + O(\phi^7)
   \hspace{1cm}
   (\phi \rightarrow 0)
\]

\[
   \mbox{tg} 15^o = 2 - \sqrt{3}
\]

\[
   e^x
   = \lim_{n \rightarrow \infty}
     \left( 1 + \frac{x}{n} \right)^n
\]

\[
   C
   =
   \left[
   \begin{array}{ccc}
   0  &  \kappa  &  0 \\
   -\kappa  &  0  & \tau \\
   0 & -\tau & 0
   \end{array}
   \right]
\]

\[
   k_W
   = [H^+] \times [OH^-] \approx 10^{-14}
   \hspace{1cm}\mbox{of}\hspace{1cm}
   k_W
   = [\mbox{H}^+] \times [\mbox{OH}^-] \approx 10^{-14}
\]
```

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

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

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

$$C = \left[\begin{array}{ccc} 0 & \kappa & 0 \\ -\kappa & 0 & \tau \\ 0 & -\tau & 0 \end{array} \right]$$

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

```
\[
   f(x)
   =
   {\textstyle \frac{1}{2 \pi}}
   \int_{-\infty}^{+\infty} e^{-itx} \Phi (t) \,dt
\]

\[
   \sum_{j=0}^{n}
   \left(\!\! \begin{array}{c} n \\ j \end{array} \!\!\right)
   \frac{(-1)^j}{m+j}
   =
   \frac{1}{m \left(\!\! \begin{array}{c} m+n \\ n \end{array} \!\!\right) }
   \hspace{1cm}
   (n \geq 0, m\geq 1)
\]
```

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

$$\sum_{j=0}^{n} \left(\!\! \begin{array}{c} n \\ j \end{array} \!\!\right) \frac{(-1)^j}{m+j} = \frac{1}{m \left(\!\! \begin{array}{c} m+n \\ n \end{array} \!\!\right)} \qquad (n \geq 0, m \geq 1)$$

```
\[
   f(x)
   =
   \left\{
   \begin{array}{lll}
   0 & \mbox{als} & x \leq 0 \\
   \frac{b^n}{\Gamma (p)} x^{p-1} e^{-bx} & \mbox{als} & x > 0
   \end{array}
   \right.
   \hspace{1cm}\mbox{of}\hspace{1cm}
   f(x)
   =
   \left\{
   \begin{array}{lll}
   0 & \mbox{als} & x \leq 0 \\
   {\displaystyle \frac{b^n}{\Gamma (p)} x^{p-1} e^{-bx} }
     & \mbox{als} & x > 0
   \end{array}
   \right.
\]

\[
   A
   =
   \left[
   \begin{array}{cccc}
   a_{11} & a_{12} & \cdots & a_{1n} \\
   a_{21} & a_{22} & \cdots & a_{2n} \\
   \vdots & \vdots & \ddots & \vdots \\
   a_{m1} & a_{m2} & \cdots & a_{mn}
   \end{array}
   \right]
\]
```

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

$$A = \left[\begin{array}{cccc} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{array} \right]$$

```
\[
   {^{55}_{25} Mn} + {^2_1 H} \,\rightarrow\,
   {^{55}_{26} Fe} + 2 \,{^1_0 n}
   \hspace{1cm}\mbox{of}\hspace{1cm}
   {^{55}_{25} \mbox{Mn}} + {^2_1 \mbox{H}} \,\rightarrow\,
   {^{55}_{26} \mbox{Fe}} + 2 \,{^1_0 n}
\]

\[
   \frac{d}{dt} \frac{\partial L}{\partial \dot{q}_k} -
   \frac{\partial L}{\partial q_k}
   = \alpha_k
\]
```

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

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

```
--------------------------------------------------------------------------
\begin{eqnarray*}
   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]
   \hspace{1cm}
   (x \rightarrow \infty)
\end{eqnarray*}

\[
   - \, \frac{h^2}{8 \pi^2 m}
   \frac{\partial^2 \Psi (x,t)}{\partial x^2} +
   V(x) \Psi(x,t)
   =
   - \, \frac{h}{2 \pi i}
   \frac{\partial \Psi(x,t)}{\partial t}
   \hspace{1cm}
   \mbox{(E. Schr\"odinger, 1926)}
\]
--------------------------------------------------------------------------
```

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

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

3 Figures

Simple drawings can be made with the `picture` environment and the associated commands.

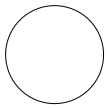
```
% \setlength{\unitlength}{1cm}
% \begin{picture}(width,height)(x-org,y-org)
%   \put(x,y){object}
%   \put(x,y){\framebox(width,heigth)[pos=tbrlc]{object}}
%   \put(x,y){\makebox ... }
%   \put(x,y){\dashbox{dash-length} ...}
% \end{picture}
```

More commands can be found in LaTeX books. An example of its use :

```
---------------------------------------------------------------------
\setlength{\unitlength}{1cm}
\begin{picture}(10,5)(0,0)
  \put(1,1){\circle{1,3}}
  \put(2,2){\begin{minipage}[b]{5em}
            this is text in a minipage
            in a picture environment
            \end{minipage}}
  \put(8,4){$\frac{\sin(x^2)}{\sqrt{z}} \, \int_5^7 y(x) \, dx $}
\end{picture}
---------------------------------------------------------------------
```

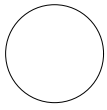
this is text in a minipage in a picture environment

$\frac{\sin(x^2)}{\sqrt{z}} \int_5^7 y(x)\,dx$



In "texmac.sty" commands `\BPI` and `\EPI` are defined to begin and end the picture environment.

```
---------------------------------------------------------------------
\BPI{1cm}(10,3)
  \put(1,1){\circle{1,3}}
\EPI
---------------------------------------------------------------------
```



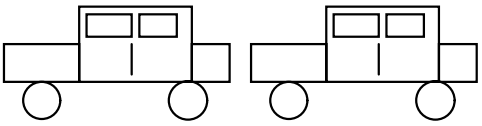
3.1 Including pictures

Making pictures in the `picture` environment from LaTeX is seldomly done by hand. Use the programs *xfig* or *ghostscript* to accomplish this job. In *xfig* you can place LaTeX formulas in the picture by placing text between single *dollar* signs. The text font must be *LaTeX Default*. Put the following lines in the file *.Xdefaults* which must be in your home directory ;

```
xfig.Latexfonts:                on
xfig.SpecialText:               on
```

Xfig allows you to export a drawing as a **.eepic** file, which represents the drawing with extended LaTeX picture commands. These commands are defined in the packages *epic.sty* and *eepic.sty* which have to be loaded in your **.tex** file with `\usepackage`. Including the drawing (eg. *fig.eepic*) in your text is easily done :

```
-----------------------------------------------------------------------
\input fig.eepic
\input fig.eepic
\\\\
-----------------------------------------------------------------------
```



this is not a car this is not a car

An Encapsulated PostScript file with the extension **.eps** can also be included in your text. The commands which do the job are defined in the package *epsf.sty*, which must be loaded with `\usepackage`. Including for example the postscript file *fig.eps* is done as if it were a formula :

```
-----------------------------------------------------------------------
$\epsffile{fig.eps}$ \hspace{3cm} $\epsffile{fig.eps}$ \\
-----------------------------------------------------------------------
```

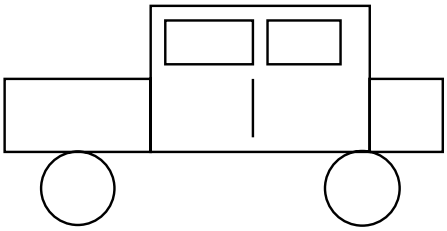
this is not a car this is not a car

In the following some commands and macros are demonstrated which are usefull for including *.eps* and *.eepic* files in LaTeX. First we will see that it is possible to scale the figures and to place formulas in the figure.

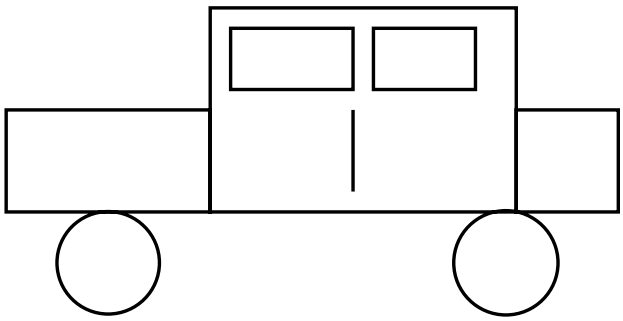
3.2 Scaling *.eps* files

Scaling of **.eps** files is done with either of two commands, as is shown in the following.

```
-------------------------------------------------------------------------
\epsfxsize=6cm
$$\epsffile{fig.eps}$$

\epsfysize=6cm
$$\epsffile{fig.eps}$$
-------------------------------------------------------------------------
```



this is not a car



this is not a car

3.3 Scaling *.eepic* files

Scaling of **.eepic** files is not straightforward, as the scaling is already done by *xfig*. To scale the picture in LaTeX we must use some Unix commands to modify the **.eepic** file.
First the file *fig.eepic* must be modified with the next commands.

```
/bin/cp fig.eepic fig.eepic.tmp
/bin/rm fig.eepic
sed -f $HOME/bin/pat fig.eepic.tmp > fig.eepic
```

It is strongly recommanded to convert the commands into an *alias*. Just put the next line in the *.cshrc.sg* file in your home directory.

```
alias cep '/bin/cp \!* \!*.tmp && /bin/rm \!* && sed -f $HOME/bin/pat \!*.tmp > \!*'
```

The alias *cep* is then always available and can be used with a parameter :

```
cep fig.eepic
```

The file *$HOME/bin/pat* must exist and contain among others the following lines :

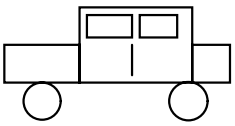
```
1,10000s/\\setlength/%\\setlength/
1,10000s/SetFigFont/SetMyFont/
```

After using *cep* the picture in *fig.eepic* can be scaled. To do this we must use some LaTeX commands which are already defined in "texmac.sty".

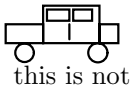
```
% \newlength{\PSA}          \setlength{\PSA}{0.0125in}
% \newlength{\PSB}          \setlength{\PSB}{0.00087489in}
% \newcommand{\picfontsize}{\normalsize}
% \newcommand{\SetMyFont}[5]{}
% \newcommand{\FIG}[3]{%
% \setlength{\unitlength}{#1#2}
% \mbox{} \begin{center} {\picfontsize #3 } \end{center}\mbox{}}
```

The *lengths* `\PSA` and `\PSB` are used for the different versions of *xfig* respectively. Changing `\picfontsize` allows the use of different text font sizes in pictures. `\SetMyFont` is an "empty" command whch replaces `\SetFigFont` and does nothing at all. The command `\FIG` is used to place the (scaled) figure in the text. Some examples are shown on the next pages, where *figm.eepic* is now the modified version of *fig.eepic*.

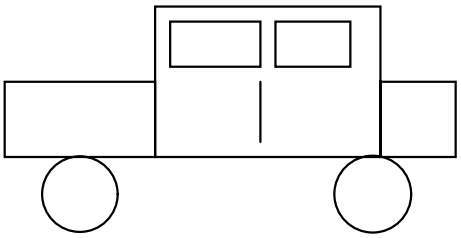
```
------------------------------------------------------------------------
\FIG{1}{\PSB}{\input figm.eepic}

\FIG{0.5}{\PSB}{\input figm.eepic}

\FIG{2}{\PSB}{\input figm.eepic}

\renewcommand{\picfontsize}{\huge}
\FIG{1}{\PSB}{\input figm.eepic}
------------------------------------------------------------------------
```



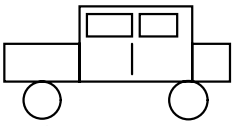
this is not a car



this is not a car



this is not a car



this is not a car

3.4 Figure text

The command \FIT, which is defined in "texmac.sty", can be used to place framed text with a picture.

```
% \newcommand{\FIT}[1]{%              % places FIgure-Text
% \mbox{}\\\framebox[\textwidth]%     % framed box off textwidth
% {\parbox{0.9\textwidth}%
% {\mbox{}\\%
% {\em #1} \mbox{}\\[-1ex] }}\\}      % figure text
```

A counter fignum in \FIT can be introduced and incremented every time \FIT is used. To accomplish this we redefine de command.

```
-----------------------------------------------------------------------
\renewcommand{\FIT}[1]{%            % places FIgure-Text
\stepcounter{fignum}%               % increments figure-counter
\mbox{}\\\framebox[\textwidth]%     % framed box off textwidth
{\parbox{0.9\textwidth}%
{\mbox{}\\%
Fig. \arabic{fignum} : %            % figure number
{\em #1} \mbox{}\\[-1ex] }}\\}      % figure text
-----------------------------------------------------------------------
```

The command \BXS is defined in "texmac.sty" :

```
% \newcommand{\BXS}[2]{%
% \setlength{\loclen}{#1}%                % #1 = width
% \framebox[\loclen]{%                    % framed box
% \parbox[t]{0.9\loclen}{%
% \makebox[0pt][l]{\rule{0pt}{1ex}}#2 }}} % #2 = object

-----------------------------------------------------------------------
bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

\BXS{\textwidth}{\begin{center} \input modeI+II.eepic \end{center}}\\
\FIT{modeI+II}

\BXS{\textwidth}{\begin{center} \input modeI+II.eepic \end{center}}\\
\FIT{modeI+II}

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 bla

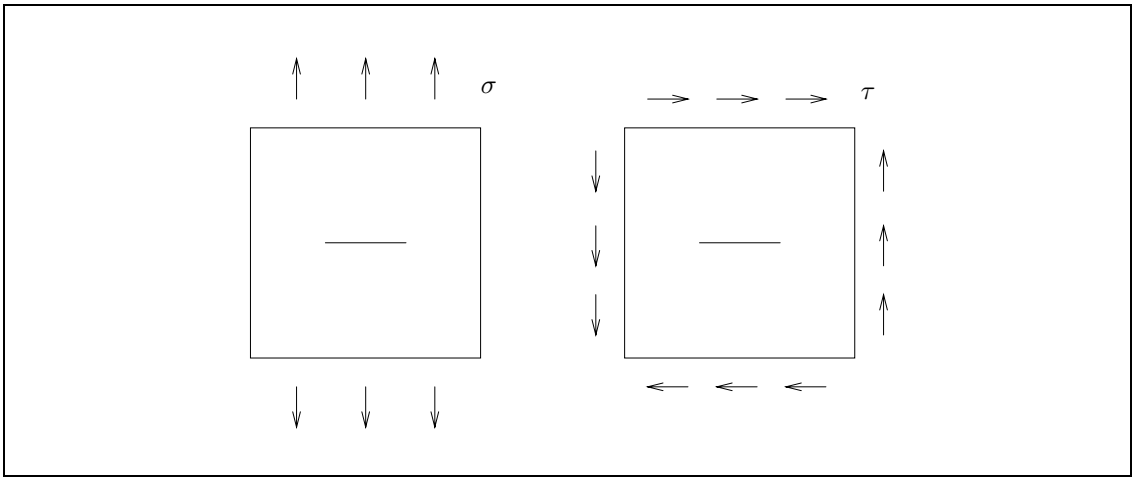


Fig. 1 : *modeI+II*

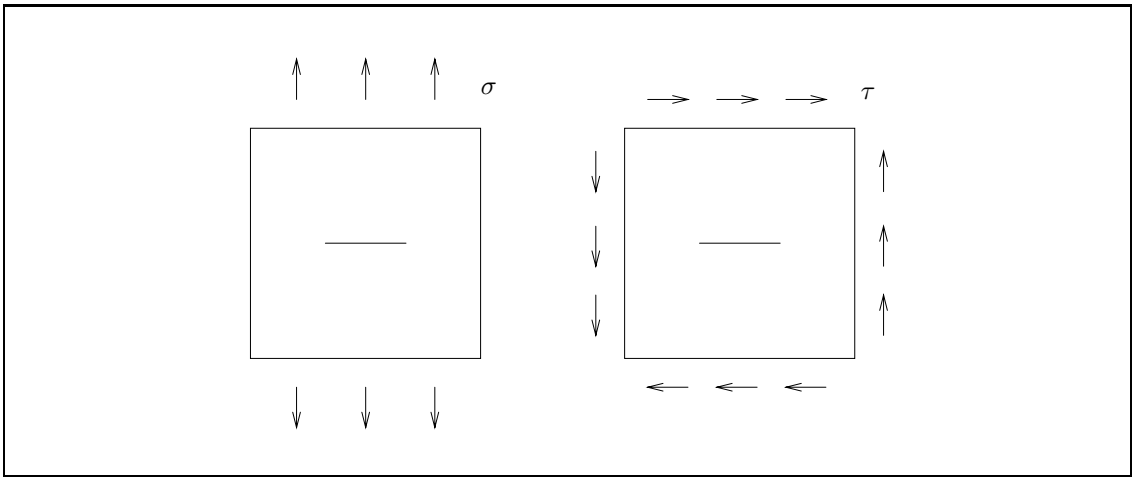


Fig. 2 : *modeI+II*

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