### Latex Fundamentals

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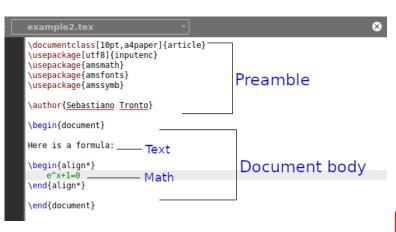


#### Latex

- Write code (like HTML, not like Python)
- 2 Compile to get a pdf file
- ???
- Profit



#### Document structure





#### Preamble

- Include packages with \usepackage
- Define properties of the document (\documentclass, \author, ...)
- Define new commands and environments



## Text formatting



# Text formatting

#### Some technicalities:

- Blocks are delimited by { and }
- ullet \textbf $\{\ldots\}$  etc. are commands with one argument
- \emph{...} is context-aware (when in doubt use this)
- Large etc. change the text until the end of the block
- Some people use {\bf Hello}, but it is deprecated



# Text formatting

```
{\tiny Hello}
                            Hello
{\scriptsize Hello}
                           Hello
{\footnotesize Hello}
                           Hello
{\normalsize Hello}
                           Hello
{\large Hello}
                           Hello
                          Hello
{\Large Hello}
                          Hello
{\LARGE Hello}
                         Hello
{\huge Hello}
                         Hello
{\Huge Hello}
```



One can write math inline, like \( \sum\_i\frac\{i\}\{2\} \), or in displaystyle: \[ \sum\_i\frac\{i\}\{2\} \]

One can write math inline, like  $\sum_{i} \frac{i}{2}$  or in displaystyle:

$$\sum_{i} \frac{i}{2}$$



For formulas spanning multiple lines you can use:

$$e^{x} = \sum_{n=0}^{\infty} \frac{x^{n}}{n!} \tag{1}$$

$$=1+x+\frac{x^2}{2}+\frac{x^3}{6}+\cdots$$
 (2)

or \begin{align\*} (...) \end{align\*} for no numbers.



- Some people use 2+2=4 instead of (2+2=4)
- Some **evil** people use \$\$2+2=4\$\$ instead of \[2+2=4\] (don't try this at home!)
- For align use \nonumber to remove one number and & to align.
- For example I always use \$2+2=4\$ and the align\* environment.



- Simple symbols: letters, numbers, +, -, =, <, > ...
- Symbols that need a command:

• Negate symbols with \not:



Some commands take one or more arguments (like \frac).
 Anything can be an argument:

$$\frac{1}{\sum_{n} \sqrt{n}}$$

• A few commands take **options**:  $\sqrt[3]{x} \rightarrow \sqrt[3]{x}$ 



• Every symbol can have a subscript and a superscript

$$x_0^{23} \rightarrow x_0^{23}$$

Anything can be a sub/superscript:

$$\left\{ \int_{\phi(y)}^{2^{n}} \left( phi (y) \right)^{2^{n}} dy dy dy dy$$



• Adjust parentheses size with \left( and \right):

$$\left(\frac{x+6}{y-2}\right)$$

• Insert text with \text and spaces with \, and \quad:

this symbol 
$$\sum_{n=0}^{\infty} \frac{x^n}{n!}$$
 is in math mode, this is not text



• Fancy letters with \mathcal, \mathbb and \mathfrak:

$$\mathcal{A}$$
  $\mathbb{R}$   $\mathfrak{p}$ 

 $\bullet$  For custom operators use \operatorname{oper}:

 $\begin{tabular}{ll} \hline \bf Pro-tip: write $$ \newcommand{R}{\mathbb R}$ and $$ \DeclareMathOperator{\lcm}{lcm}$ in your preamble! \\ \end{tabular}$ 



- Wikibooks page on Math mode: https://en.wikibooks.org/wiki/LaTeX/Mathematics
- Advanced stuff: https://en.wikibooks.org/wiki/LaTeX/Advanced\_Mathematics
- List of Mathematical symbols: https://www.caam.rice.edu/~heinken/latex/symbols.pdf



#### **Environments**

\begin{something} Inside an environment \end{something}

- We have seen document and align
- Text and symbols appear differently depending on the environment
- Certain commands are specific to an environment
- You can define new environments



#### **Environments**

#### Lists: itemize and enumerate

First:

$$2 + 2 = 4$$

Second

```
\begin{itemize}
    \item First: \[2+2=4\]
    \item Second
\end{itemize}
```



#### **Environments**

Tables: tabular (text) and array (Math mode)

```
\begin{tabular}{r|cc}
    This & is & just \\
    \hline
    a & boring & table
\end{tabular}
```

Matrices: array with parentheses or pmatrix



#### Sections

- Use \section{Section Name} to start a new section
- Also: \chapter (book only), \subsection, subsubsection...
- \section\*{Name} for no number
- Sections after \appendix are numbered differently



#### Theorems

- In preamble: \usepackage{amsthm}
- Also in preamble \newtheorem {envname}{Theorem}
- Use \newtheorem\* for no number



#### Theorems

```
\newtheorem{theorem}{My Theorem}{section]
\newtheorem{pr}{theorem]{Proposition}

\theoremstyle{definition}
\newtheorem{defin}{New definition}{section]
\newtheorem{cor}{Corollary}[theorem]

\theoremstyle{remark}
\newtheorem*{warning}{Achtung}

...
\section{Second section}
```

\begin{theorem} Important Fact \end{theorem}
\begin{cor} Follows from Important Fact \end{cor}
\begin{defin} A new concept \end{defin}

\begin{pr}[Gauss] Another fact \end{pr}

\begin{warning} Don't make this mistake! \end{warning}

```
3.6 (F) 0.1 ( )
```

My Theorem 2.1. Important Fact

Second section

Corollary 2.1.1. Follows from Important Fact

New definition 2.1. A new concept

Achtung. Don't make this mistake!

Proposition 2.2 (Gauss). Another fact

```
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```

#### End of the lecture

#### For next time:

- Install Latex on your PC
- Start writing something in Latex (e.g. homework)
- Email me if you have any question

