# Unser erster Text in LaTeX

**Hausübung—Computermathematik W 2016/2017**

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Ihre Aufgabe ist: Erstellen Sie ein LaTeX-Dokument welches unten stehende Erfordernisse (Checkliste) erfüllt. Als Sprache ist Deutsch oder Englisch zu wählen.

Einen guten Einstieg in das Thema liefert die Seite LaTeX.tugraz.at. Diskussionen bitte über das im Lehrveranstaltungs-Moodle eingerichtete Forum. Bitte Links zu nützlichen Tutorials und Webseiten im Moodle (Wiki) posten.

Die Abgabe erfolgt über die SageMath-Cloud bis zum **Donnerstag, dem 22. Dezember, um 12:00**. Es sind für diese Hausübung 10 Punkt zu erwerben.

## 1 Checkliste

Das Dokument enthält

1. Titel & AutorIn; Matrikelnummer und E-Mail-Adresse als Fußnote,
2. Überschriften und ein Inhaltsverzeichnis,
3. komplexere Formeln (mindestens drei; zumindest eine davon mehrzeilig),
4. Referenzen (Querverweise) auf Formeln und Überschriften,
5. ein Bild oder eine Abbildung (Bild/Abbildung muss nicht selbst erstellt werden) als „Gleitobjekt“,
6. sinnvollen Text,
7. grammatikalisch und logisch einwandfreie sprachliche Sätze und
8. Text bzw. LaTeX-Code, welcher die Richtlinien der Abschnitte 2 und 3 erfüllt.

Weiters enthält das Dokument

9. einen Satz, ein Lemma, eine Proposition oder Ähnliches,

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10. Kopf- und Fußzeilen,
11. ein Literaturzitat,
12. das Paket `microtype` (mit „sinnvollen“ Optionen),
13. eine Tabelle,
14. eine Liste (Nummerierung oder Aufzählung),
15. Quellcode oder einen kurzen Algorithmus,
16. Links ins Web (anklickbar),
17. Fußnoten,

wobei aus dieser Liste (Punkte 9 bis 17) zumindest fünf Punkte auszuwählen sind.

Beachten Sie die nachfolgenden Richtlinien (welche auch für deutschsprachige Texte gelten).

# 2 Some Issues

## 2.1 Generalities

1. Be consistent!
2. Use a spell-checker.
3. Read through the text before showing it to someone else. Make sure your document compiles without errors.
4. Avoid to many : in the text, in particular before formulas. For example,

   The result is
   $$\sum_{i=1}^{n} \frac{1}{i}.$$
   is fine (no need to write a : after “is”). Instead of

   We obtain the following:
   $$\sum_{i=1}^{n} \frac{1}{\sqrt{i}}.$$
   simply write

   We obtain
   $$\sum_{i=1}^{n} \frac{1}{\sqrt{i}}.$$

## 2.2 Math

1. Use `equation` or `align` (or similar) environment for display equations like

$$c^2 = a^2 + b^2.$$

2. By default, display equations are centered (but the document class may changes this).

3. Align multi-line equations by $=$, $\leq$, etc. by using the `align`-environment and the `&`-operator. For example

```
\begin{align*}
  a &= 42 \log n, \\
  b &= 0.
\end{align*}
```

   produces

$$a = 42 \log n,$$
$$b = 0.$$

4. There is no need to number every equation, but only those which you want to refer to. (Use the starred versions of the environments like `equation*` for this.)

5. Put the whole equation in `$...$` or environments like `equation` and not each part separately. (good: `$A=B$`, bad: `$A$=$B$`)

6. All formulas need to be written in mathematical mode; this includes single letter variables, e.g. "Let $x$ be ..." (`Let $x$ be \dots`).

7. Usually multiplication is symbolized by a $\cdot$ or skipped completely (and only in exceptional cases $*$ is used.)

8. A cartesian product is written like $A \times B$ (`$A \times B$`).

## 2.3 Punctation, ...

1. Use correct quote marks (depending on the language). In particular, write
   a) "english" (`` ``english'' ``),
   b) "'deutsch"' (`"`deutsch"'`).

2. Use spaces correctly. For example,
   a) there is no space before a comma, but there is one after a comma,
   b) there is always a space after a full-stop, and
   c) there is no space before a footnote (i.e., before the footnote sign in the text).

## 2.4 Formatting

1. LaTeX does the formatting for you; do not interfere within the text. If you want to change something, redefine the corresponding macros of the document class.

2. There is no need to start each section/subsection with a preceding `\newpage`. If necessary, then redefine the corresponding macros of the document class.

3. Use `\emph` to emphasize something (and not `\textit` or similar).

4. Usually there is no need to use `\\`, `\newline`, etc. in the main text. But, for example, `\\` is used when writing matrices.

   LaTeX starts a new paragraph when making an empty line in the code.

5. Use environments for definitions, theorems, lemmata, .... You can define your own by using `\newtheorem`.

6. Use `\url` or `\href` (when using hyperref) for links and email addresses. For example, use

   ```
   \href{mailto:me@example.com}{me@example.com}
   ```

   or

   ```
   \href{mailto:me@example.com}{\nolinkurl{me@example.com}}
   ```

   or similar constructions for email addresses when using hyperref.

7. Use `\verb` or environments like `verbatim` for code. There are various environments to write algorithms nicely as well.

8. If you have some enumerations use `enumerate`-environment. If you want them non-numbered, use `itemize`. Do not use these environments for just one item or if you do not have an enumeration.

## 2.5 Floating Environments

1. Figures, tables, etc. in floating environments need a caption.

2. There has to be a reference inside the text to a floating object.

3. Usually LaTeX positions floating objects quite well; only if there are many of them and/or large objects it needs some help. Do not insist on "the figure has to be positioned exactly here".

### 2.6 References

1. Use references and labels correctly, in particular, use `\ref{sec:introduction}` instead of `1.1` directly.

2. There should be at least one `\cite` in the text for each entry in the bibliography.

## 3 Guidelines with a Focus on Mathematical Texts

### 3.1 Generalities

1. End all sentences with a full stop, even it the sentence ends in a displayed equation.

2. Enumerations always need commas to separate their items, even if part of displayed equations or a "cases" construction.

3. Do not start a sentence with a formula.

### 3.2 English

1. A mathematical text is a formal text, so please write "do not", "cannot", "it is", "we will" etc. instead of the abbreviated forms "don't", "can't", "it's", "we'll".

2. When refering to numbered formal statements such as "Theorem 5.6", write capital "T" as "Theorem 5.6" is considered to be a name in this case. When refering to it without number, e.g., "in order to prove the theorem", use lower case. This does, however, not apply to page numbers, always write "on page 25".

3. No comma before an "if" clause at the end of a sentence.

4. The use of "a" and "an" depends on the pronunciation and not on the spelling, e.g., a unit, an $x$, a $u$.

### 3.3 Usage of TEX

1. Make sure that even one-letter-formulæ are set in mathematics mode, e.g., "$x$-axis".

2. If you write `Res` in mathematical mode, you get $Res$, meaning $R \cdot e \cdot s$. To declare new operators, use `\DeclareMathOperator{\Res}{Res}` in the preamble and `\Res(f(z),z=i)` in the text (or only `\operatorname{Res}(f(z),z=i)` in the text) for new operators such as $\operatorname{Res}(f(z), z = i)$. Use `\mathit{unique}` for $\mathcal{D}_{unique}$.

3. Avoid "`eqnarray`", cf. [1].

4. Not as bad (i.e., currently, I do not recognize when reading the output only, but that may change ...), but still: do not use `$$` for displayed equations, write `\[` or `\begin{equation*}`, cf. [2].

5. Usually, TEX does correct spacing (once the semantically correct commands are given), but sometimes, help is needed:
   a) Write `\int x\,dx` for $\int x\,dx$.
   b) Write `a!\,b!` for $a!\,b!$.
6. Use "`\mid`" for the binary relation "|" (such as divisor relation and conditional probabilities), "`\mvert`" for ("such that" in a set),[1] but use "`\lvert`" and `\rvert` for absolute values.[2] For absolute values, the recommendation is to define a command as follows:

   ```
   \providecommand{\abs}[1]{\lvert#1\rvert}
   ```

7. Write `f\colon A\to B` for $f\colon A \to B$, since `:` is a relational symbol, which is used, for example, for proportions like $1 : 2$.
8. After an abbreviation such as "e.g.", "i.e.", "cf.", "etc." followed by a space, tell TEX that the sentence is not yet completed: `cf.\ `.
9. Distinguish between a comma in text mode (enumeration) and a comma in mathematical text (e.g., pairs): Write "Let $x$, $y$ be integers" (i.e., "`$x$, $y$`") instead of staying in mathematics mode "Let $x, y$ be integers" (i.e., `$x, y$`).
10. Please do not use `\left` and `\right` per default, they often generate exaggerated delimiters.

## References


[1] Lars Madsen, *Avoid eqnarray!*, `http://tug.org/pracjourn/2006-4/madsen/`.

[2] Various authors, *Why is \[... \] preferable to $$ ... $$*, `http://tex.stackexchange.com/questions/503/why-is-preferable-to`


[1] There is no visual difference between `\mid` and `\mvert`, but the given distinction seems to more correct from a semantic point of view.

[2] For absolute values of a variable or a number, `|` would be acceptable, but for operators etc., spacing is wrong: Compare $|\log x|$ and $|\log x|$.