\LaTeX\ do’s and don’t’s

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Introduction. This is not a \LaTeX\ manual. Indeed, I am supposing that anyone reading this is more or less proficient at using \LaTeX. What this is is basically a list of common \LaTeX\ typesetting errors that I have seen over the years, and some rules for not making these errors. It simultaneously is a style manual for some of the rules of document preparation that are consistently broken.

Note. I make mistakes too, and you will doubtless find mistakes of the sort that I am inveigling against in my own written work. If so, please let me know, and I will include these offences here with a note that the offender is me.

Another note. I am writing this for my own students, so I am assuming the reader is a mathematician.

Font commands.

1. The commands \textit, \textbf, \textsf, and \texttt are obsolete. In most cases where these commands were previously used, one now uses \textit, \textbf, \textsf, and \texttt, respectively. Where before one typed \texttt{\it text}, one now types \texttt{\it text}.

2. Similarly, the command \textit is obsolete and has been replaced with \textbf. Where before one typed \texttt{\em text}, one now types \texttt{\em text}.

Funniness with italic text. Often theorems and such are stated in an italic font. There can sometimes be issues with italic fonts and mathematics and punctuation. Let me illustrate with some italic text.

If $\Gamma$ is the usual $\Gamma$-function, then this is different from a general function $f$.

Note that the symbol $\Gamma$ is an upright symbol, and is preceded by the tall italic letters “f” and “l.” These letters visually invade the space for the symbol $\Gamma$.

To fix this, use the following \LaTeX:

If\ $\Gamma$ is the usual $\Gamma$-function, then this is different from a general function\ $f$.

which produces

If $\Gamma$ is the usual $\Gamma$-function, then this is different from a general function $f$.

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Note that the \ helps out with tall italic fonts invading math symbol space. Also note that there is a \ following the math symbol at the end of the equation. This is a good idea, in general, since the \ symbol forces \[\text{LATEX}\] to understand that the punctuation is meant to be end of the sentence punctuation. \[\text{LATEX}\] will do this by default most of the time, but not all of the time.

Summary: When using italic fonts, the \ should be placed before all math and the \ should be used following math if there is any text immediately after the $-sign.

**Numbering, labelling, and referencing.**

1. Never have an object with a “0” in its number. For example, “Section 0.1” is very bad form. Do what you have to do to make sure this does not happen. Normally, if you are writing something where these sorts of numbers are coming up, it is because your document organisation needs rethinking.

2. The \[\text{LATEX}\] \texttt{\textbackslash label} and \texttt{\textbackslash ref} commands are useful. *Always use them.* If you ever refer to a numbered object, the way to do it is label it using \texttt{\textbackslash label} and then refer to it using \texttt{\textbackslash ref}. *Never* do this by hand. Doing so is lazy and will inevitably lead to errors that are nearly impossible to notice.

3. Make your life easier by using an intelligent labelling scheme. For example, use prefixes like \texttt{eq:} for equations, \texttt{the:} for theorems, etc.

4. When you reference an equation using \texttt{\textbackslash ref}, there will be no parentheses around the equation number. If you use the \texttt{amsmath} package, then the command \texttt{\textbackslash eqref} will take care of this.

**Lists.** \[\text{LATEX}\] has a few list environments—\texttt{enumerate} and \texttt{itemize} are the most commonly used—and you are sort of stuck with them if you want your \[\text{LATEX}\] files to be transportable. However, I like to use customised list environments often, since I think the standard \[\text{LATEX}\] lists are often ugly; for example, I am using a customised list in this document. \[\text{LATEX}\] has tools for making customised lists using the \texttt{\textbackslash list} command. This is described by Goossens, Mittelbach, and Samarin [1994].

Here are a few issues to keep in mind with lists.

1. In the preceding section I implored you to never reference numbered objects “by hand.” You will be tempted to not do this for items in lists. Be strong; resist the temptation; label list items using the \texttt{\textbackslash label} command and refer to them using the \texttt{\textbackslash ref} command. Remember, be strong!

2. Grammar and punctuation in lists is often done wrongly. Please refer to [Chicago Manual of Style] for the exact rules. However, here are some pointers. Here are two grammatically suitable lists punctuated properly.

**List one:**

This is a list which makes the following points:

(a) if you use a lead in to the list like the one here (often using the word “following”), then you need to put a colon before the list starts;
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(b) also, with this style of list, the way you punctuate the items is with a semicolon at
the end of each item;
(c) finally, you need no “and” before the last item in the list like you would with a
normal text list.

List two:
This is another list and the points made by this list are
(a) that it is possible to have an enumerated list which is just like a list you might
write in text,
(b) that such a list does not require the colon preceding it like the list above,
(c) that indeed it would be wrong to use a colon here,
(d) that commas are to be places at the ends of list items, just like in a regular text
list, and
(e) that the “and” has to be included here, just like a regular text list.

Figures and tables.
1. Use figures. Do not be a slacker and not include a useful figure because it will take you
a half a day to make it. Take the half a day, and do your job properly. The world will
thank you.
2. Some plotting and drawing programs produce extremely tacky-looking text. A useful
LaTeX package in this regard is psfrag. You can type in some coded text which will be
converted to LaTeX output in the .ps or .pdf file. (Read the package documentation.)
3. A caption is a one-liner and does not need a period at the end. If you want to add a more
substantial description of a figure, this is a legend, and can be written as text in the
usual way. A legend should be something requiring more than one sentence; otherwise
a caption should be used.
4. Remember that captions for tables go above the table.

Hyphens. There are three sorts of hyphens one can use in LaTeX. Here they are, and
when they are used.
1. –: This is the usual hyphen, and is used in the usual hyphen way. For example, the text
   multi-taper spectral estimation, Joseph-Louis Lagrange, and
   Tulio Levi-Civita
   gives the following output:
   multi-taper spectral estimation, Joseph-Louis Lagrange, and Tulio Levi-Civita
2. \textendash: Use this to separate names. For example, the text
   Euler\textendash{}Lagrange, Stefan\textendash{}Sussmann
   gives the following output:
   Euler–Lagrange, Stefan–Sussmann
3. \textemdash: This hyphen gives “parenthetical comments.” For example, the text
The main thing—if you must know—is to use hyphens properly.

Equations.

1. Equations are punctuated like they are part of the text, which they are.
2. Mathematical expressions can be “inline” like this: \( x^2 + y^2 = z^2 \), or “displayed” like this:

\[
\begin{align*}
  x^2 + y^2 &= z^2.
\end{align*}
\]

About inline mathematical expressions, ask yourself, “Would this be better displayed?” If an inline expression spills into the next line, maybe it was meant to be displayed.

3. Typesetting multi-line equations can take some fiddling. First of all, use the \texttt{amsmath} package, as it offers intelligent environments for typesetting long displayed equations. I make the most use of \texttt{align}, \texttt{multiline}, and \texttt{gather}. Here’s how they work.

(a) The text

\[
\begin{align*}
  a - (b - c) &= a - b + c \\
  &= c - (b - a)
\end{align*}
\]

which gives the following output:

\[
\begin{align*}
  a - (b - c) &= a - b + c \\
  &= c - (b - a)
\end{align*}
\]

Note that the \texttt{\;} gives the correct spacing.

(b) The text

\[
\begin{align*}
  (a-b+c-d+e-f+g-h+i-j+k-l+m-n-o-p+q+r+s-t+u-v+w+x+y-z) \\
  = -(b-a+d-c+f-e+g+j-i+l+k+n+m+p-o+r-q+t-s+v+u+x+w+z-y)
\end{align*}
\]

gives the following output:

\[
\begin{align*}
  (a-b+c-d+e-f+g-h+i-j+k-l+m-n-o-p+q+r+s-t+u-v+w+x+y-z) \\
  = -(b-a+d-c+f-e+g+j-i+l+k+n+m+p-o+r-q+t-s+v+u+x+w+z-y)
\end{align*}
\]

Note that there is no alignment here.

(c) The text

\[
\begin{align*}
  a-b=c-d \\
  b-a=d-c
\end{align*}
\]

gives the following output:

\begin{align*}
    a - b &= c - d \\
    b - a &= d - c
\end{align*}

Note that there is no alignment.

4. The \texttt{cases} environment is useful for defining things where the domain is partitioned. For example, the text

\begin{verbatim}
\begin{equation*}
    f(x) = \begin{cases}
        y_1, & x \in A_1, \\
        y_2, & x \in A_2
    \end{cases}
\end{equation*}
\end{verbatim}

gives the following output:

\begin{equation*}
    f(x) = \begin{cases}
        y_1, & x \in A_1, \\
        y_2, & x \in A_2
    \end{cases}
\end{equation*}

Note the commas. They are necessary.

5. I do not think that symbols like $\forall$ and $\exists$ belong in polished written work. Write these out in English, or whatever language you are using.

Bibliography.

1. Use \texttt{BibTeX}. Do not type your bibliography manually. \texttt{BibTeX} saves time in the end, and can be used to ensure a consistent style in your bibliography.

2. Consistency can be hard to achieve, but must be achieved. Here are a few places where one can get tripped up, and some suggestions for not stumbling.

   (a) \textit{Full author names, or initials}: If you use full author names for one author, you must do so for \emph{all} authors. It can be a bit of an effort to locate full author names for all authors, although a visit to \texttt{MathSciNet} is helpful in this regard. My recommendation is to (i) always enter as much as you know about an author’s name in your \texttt{.bib} file and (ii) use a bibliography style that only outputs author initials, i.e., not the \texttt{plain} bibliography style. The first suggestion makes sure you are not lazy and the second ensures consistency.

   (b) \textit{Capitalisation}: A basic rule is: Titles are not capitalised for titles of papers, but are capitalised for books.

   The right way to do this is to let the \texttt{BibTeX} style handle it. Thus, in your \texttt{.bib} file, you should capitalise all titles in the usual way, and let the style file decide on what the output should be. One problem with this is that words that need to be capitalised always, e.g., names, must be treated separately. Thus, in the \texttt{.bib} file, one would type the title

   \texttt{A Proof of the \{R\}iemann Hypothesis}
to ensure that “Riemann” is always capitalised, no matter what style file is used.

(c) *Issue numbers for journals*: Always provide issue numbers for journal papers. You can mostly look these up on MathSciNet, but a general Google search is also helpful. But just do it in any case.

(d) *Journal titles*: A challenging and troublesome matter is journal titles. Sometimes one wants full names for journals, and sometimes one wants abbreviations. But one also wants only one .bib file. Here’s how I get around this. I always use macros for journal names. Thus I have two files, macrosfll.bib and macrosabb.bib that only contain macros. I use them for publisher information and book series titles, as well as journal titles. Here are a few lines from macrosfll.bib:

```plaintext
@STRING{annma2 = "Annals of Mathematics. Second Series"}
@STRING{mcgraw = "McGraw-Hill"}
@STRING{mcgrawaddress = "New York"}

@STRING{gtm = "Graduate Texts in Mathematics"}
```

Here are the corresponding lines in macrosabb.bib.

```plaintext
@STRING{annma2 = "Ann. of Math. (2)"}
@STRING{mcgraw = "McGraw-Hill"}
@STRING{mcgrawaddress = "New York"}

@STRING{gtm = "Graduate Texts in Mathematics"}
```

For entries in my .bib file, I then use the macros, i.e., annma2, mcgraw, mcgrawaddress, and gtm where I want the corresponding strings to appear. I hope you get the idea.

Also, you will want to use proper titles for journals, not just a rendition of the title that you think is okay. Approved titles can be found in the files amsfll.ttz and amsabb.ttz which can be Googled. If you cannot find a title in these files, you will have some work to do, particularly for older papers. However, with some persistence, you can acquire a nice set of macros for journal titles. Good luck!

(e) *Book series and numbers*: If you provide the series and number in series for one book, you must do so for all books in your bibliography. This takes some effort, but gives a bibliography that looks as if it was prepared by someone giving a household rodent’s behind. And once you enter the information in your .bib file once, it is there forever.

(f) *Edition numbers*: Always type (for example) edition = 2 in your .bib file, and not (for example) edition = "Second" or edition = "2nd". Let the style file determine how the output will look.

3. It is best to adopt a rational policy for labelling BibTeX entries. As an example of a rational policy, a paper by Albert Einstein and Edward Witten, published in 1965 might be tagged as AE/EW:65. If they wrote two papers in 1965, they might be labelled as AE/EW:65a and AE/EW:65b.
General.

1. Did you spell check your document?

2. Don’t embarrass yourself by using the obsolete-since-1996 \LaTeX209. You can tell when you are doing this if you are using the command \texttt{\documentstyle} instead of \texttt{\documentclass}.

3. When you run \LaTeX{} and \BibTeX{}, make sure there are no errors or warnings that require attention. If you see an error, fix it. Yes, \LaTeX{} will compile with errors and warnings, but these are present for a reason. The files \texttt{foo.log} and \texttt{foo.blg} contain the log files for \LaTeX{} and \BibTeX{}.

4. Did you spell check your document?

5. Particularly look out for overfull hboxes. Using the command \texttt{\sloppy} in the preamble of your document (the part of the document between \texttt{\documentclass} and \texttt{\begin{document}}) will get rid of most overfull boxes in the text, but sometimes at the cost of very poor spacing in the text. Keep a lookout for this. Note that \texttt{\sloppy} does not apply to equations, and overfull equations happen frequently.

References
