LaTeX do's and don't's

Andrew D. Lewis*

2017/10/27

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 `\rm`, `\it`, `\bf`, `\sf`, and `\tt` are obsolete. In most cases where these commands were previously used, one now uses `\textrm`, `\textit`, `\textbf`, `\textsf`, and `\texttt`, respectively. Where before one typed `{\it text}`, one now types `\textit{text}`.
2. Similarly, the command `\em` is obsolete and has been replaced with `\emph`. Where before one typed `{\em text}`, one now types `\emph{text}`.
3. By including `\RequirePackage[l2tabu,orthodox]{nag}` as the first line in your document preamble, your log file will advise you of any other obsolete commands/packages you are using.[1]

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 Γ *is the usual* Γ*-function, then this is different from a general function* f.

Note that the symbol Γ is an upright symbol, and is preceded by the tall italic letters "f" and "l." These letters visually invade the space for the symbol Γ.

To fix this, use the following LaTeX:

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

*Professor, Department of Mathematics and Statistics, Queen's University, Kingston, ON K7L 3N6, Canada
Email: `andrew.lewis@queensu.ca`, URL: `http://www.mast.queensu.ca/~andrew/`

[1] Thanks to Ole Nielsen for drawing my attention to this.

which produces

If Γ *is the usual* Γ*-function, then this is different from a general function* f.

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 LaTeX to understand that the punctuation is meant to be end of the sentence punctuation. 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 LaTeX `\label` and `\ref` commands are useful. *Always use them.* If you ever refer to a numbered object, the way to do it is label it using `\label` and then refer to it using `\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 `eq:` for equations, `the:` for theorems, etc.
4. When you reference an equation using `\ref`, there will be no parentheses around the equation number. If you use the `amsmath` package, then the command `\eqref` will take care of this.

Lists. LaTeX has a few list environments—`enumerate` and `itemize` are the most commonly used—and you are sort of stuck with them if you want your LaTeX files to be transportable. However, I like to use customised list environments often, since I think the standard LaTeX lists are often ugly; for example, I am using a customised list in this document. LaTeX has tools for making customised lists using the `\list` command. This is described by Mittelbach, Goossens, Braams, Carlisle, and Rowley [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 `\label` command and refer to them using the `\ref` command. Remember, be strong!
2. Grammar and punctuation in lists is often done wrongly. Please refer to [*The Chicago Manual of Style* 2010] 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;

(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\textemdash{}if you must know\textemdash{}is to use hyphens
   properly.
   ```

   gives the following output:

   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:

   $$x^2 + y^2 = z^2.$$

   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 amsmath package, as it offers intelligent environments for typesetting long displayed equations. I make the most use of `align`, `multline`, and `gather`. Here’s how they work.

   (a) The text

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

   gives the following output:

   $$\begin{aligned} a-(b-c) =&\; a-b+c\\ =&\; c-(b-a) \end{aligned}$$

   Note that the `\;` gives the correct spacing.

   (b) The text

   ```
   \begin{multline*}
   (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+h-g+j-i+l-k+n-m+p-o+r-q+t-s+v-u+x-w+z-y)
   \end{multline*}
   ```

   gives the following output:

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

   Note that there is no alignment here.

   (c) The text

```
\begin{gather*}
a-b=c-d\\
b-a=d-c
\end{gather*}
```

gives the following output:

$$\begin{gather*}
a-b=c-d\\
b-a=d-c
\end{gather*}$$

Note that there is no alignment.

4. The `cases` environment is useful for defining things where the domain is partitioned. For example, the text

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

gives the following output:

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

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 BibTeX. Do not type your bibliography manually. BibTeX saves time in the end, and can be used to ensure a consistent style in your bibliography.
2. Think seriously about not using BibTeX, and instead using BibLaTeX. If you are a long time user of BibTeX (like I was), converting your database will take a long time. But the cross-referencing capabilities and updated fields of BibLaTeX will transform your bibliographies for the better.
3. 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) *Full author names, or initials*: If you use full author names for one author, you must do so for *all* authors. It can be a bit of an effort to locate full author names for all authors, although a visit to 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 `.bib` file and (ii) use a bibliography style that only outputs author initials, i.e., not the `plain` bibliography style. The first suggestion makes sure you are not lazy and the second ensures consistency.

(b) *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 BibTeX style handle it. Thus, in your `.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 `.bib` file, one would type the title

```
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* (BibTeX version): 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`:

```
@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`.

```
@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) *Journal titles* (BibLaTeX version): The same ideas as outlined above for BibTeX can be used with BibLaTeX, but the capabilities of BibLaTeX make for even better database structure.

The `xdata` field behaves a little like the `STRING` field above. It has the additional advantage, however, that an `xdata` entry can itself hold more than one field. For example, I have in my file `journals-full.bib` the lines

```
@XData{annma2,
  journaltitle = {Annals of Mathematics. Second Series},
  issn =   {0003-486X}
}
```

while in my file `journals-abb.bib` I have

```
@XData{annma2,
  journaltitle = {Ann. of Math. (2)},
  issn =   {0003-486X}
}
```

In `publishers.bib` I have the lines

```
@Xdata{springer,
  publisher = {Springer-Verlag},
  location =  {New York\fshyp{}Heidelberg\fshyp{}Berlin}
}
```

and

```
@Xdata{gtm,
  series = {Graduate Texts in Mathematics},
  xdata = {springer}
}
```

As you see, you can use `xdata` within `xdata`. Nice!

BibLaTeX also gives you a functioning `crossref` field which references another entry in the database. I use this for citing articles in a collection. The collection has its own entry in the database, and individual papers in the collection use `crossref` to include this information. Nice!

(f) *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.

(g) *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.

4. 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 `\documentstyle` instead of `\documentclass`.
3. When you run LaTeX and BibLaTeX, 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 `foo.log` and `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 `\sloppy` in the preamble of your document (the part of the document between `\documentclass` and `\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 `\sloppy` does not apply to equations, and overfull equations happen frequently.

References

Mittelbach, F., Goossens, M., Braams, J., Carlisle, D., and Rowley, C. [1994] *The LaTeX Companion*, 2nd edition, Addison Wesley: Reading, MA, ISBN: 978-0-201-36299-2.

The Chicago Manual of Style [2010], 16th edition, University of Chicago Press: Chicago, IL, ISBN: 978-0-226-10420-1.