Ten TEX Tricks for the Mathematician

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TEX has changed the face of mathematical typesetting. If you look at the proceedings from a conference published 10 years ago, you will probably find that most of the articles were prepared with a typewriter. Today, most of them will be done by TEX. More and more monographs are also produced using the author's TEX file. Is this a step forward?

For proceedings, I would definitely say yes. The typewriter will go the way of the dinosaurs, and I'm not going to miss it. But when it comes to monographs, the author's camera ready copy must be compared to professionally set books. An expert TEXnician can produce output of the highest standard, but the average TEX author/typist fails miserably when compared to professional typesetting. Most authors/typists are not very knowledgeable about TEX or mathematical typography. They tend to make the same common mistakes. The purpose of this brief article is to try to point out some such errors. This list reflects my personal choice. I would like to thank the referee for helpful comments.

All page references are to the seventh printing of you-know-which book. I don't always give details about how to achieve the different effects. This is partially because the syntax would be different depending on which dialect of TEX you use.

1. *Set operator names in roman.* My head goes into a spin whenever I read about $Spin(n)$. Look at the spacing! Math italics uses special spacing (p. 164). As a general rule, *every* mathematical term with more than one letter should be set in roman, whether or not it is in Knuth's list (p. 162 and p. 361). So please write $\mathrm{Spin}(n)$. If you use $\mathcal{AMS}$-LATEX, you can write `$\operatorname{Spin}(n)$`,

or you can define `\Spin` to be `\mathop{rm Spin}\nolimits`. A clever trick (due to the referee) is to define a macro like

```
\def\newop#1
{\expandafter\def\csname #1
\endcsname{\mathop{\rm #1}\nolimits}}
```

Then `\newop{Spin}` will define a command `\Spin` that can be used throughout the paper.

2. *Scale the delimiters.* Constructions like

$$S = \{\begin{pmatrix} \pm 1 & 0 \\ 0 & \pm 1 \end{pmatrix}\}$$

are the sign of a true TEX-novice. Please write

$$S = \left\{\begin{pmatrix} \pm 1 & 0 \\ 0 & \pm 1 \end{pmatrix}\right\}.$$

I also find $\big[[X, Y], Z\big]$ easier to read than $[[X, Y], Z]$.

3. *Use / more often.* Always write a/b in text. Big fractions like $\dfrac{a}{b}$ can mess up a whole paragraph. This also raises another issue. You should understand the difference between display style and text style. TEX has a tendency to use text style when I feel display style would be better. I prefer

$$f(x) = \frac{g(x)}{h(x)} \quad \text{to} \quad f(x) = \tfrac{g(x)}{h(x)}.$$

4. *Use the right kind of dots.* This is slightly controversial. Everybody I know writes $1, \ldots, n$ and $x_1 \cdots x_n$, but Knuth (p. 172) wants $x_1 \ldots x_n$. Anyway, don't write

$$x_1 + \ldots + x_n.$$

5. *Should you break before or after +'s?* The rule is simple (p. 195): you break *after* binary operators in text and *before* binary relations in displays. And when you break before a $+$, remember to write `{}+x`, so TEX knows that the $+$ is a binary operator (p. 196).

6. *Be generous with space.* Watch for places to put `\,` (pp. 167–169). Don't you think $(\,,\,)$ looks better than $(,)$? Learn how to insert space between formulas in display, or use constructions that do it for you. Compare

$$\begin{aligned} f(x) &= x \\ g(x) &= x^2 \end{aligned} \quad \text{and} \quad \begin{aligned} f(x) &= x \\ g(x) &= x^2. \end{aligned}$$

Notice how the parentheses almost touch in the first one.

8. *Get your bibliography right.* Don't write *Notices Amer. Math. Soc.*, write *Notices Amer. Math. Soc.* (Use `.\␣` to get proper spacing.) And write pp. 1–40 instead of pp. 1-40 (remember to use `--`, see p. 4).

9. *Don't use symbols for visual effects. Learn to use the proper commands.* On a typewriter, people must use logical symbols like < for visual effects, like writing $< x, y >$ to denote an inner product. Fortunately, TEX has a huge supply of mathematical symbols and delimiters. In this case you should use the so-called angle brackets, to get $\langle x, y \rangle$ (`$\langle x,y \rangle$`). And remember to write $\langle \, , \, \rangle$ (`$\langle \, , \rangle$`) and not $\langle , \rangle$ (`$\langle , \rangle$`).

Similarly, don't write $x \epsilon S$ (`$x \epsilon S$`), but $x \in S$ (`$x \in S$`). First of all, `\epsilon` is the wrong symbol, and secondly the spacing is wrong. When you use `\in`, TEX knows that you want a binary relation, so it puts in the proper amount of space.

I'm also tired of seeing "this" (`"this"`)! It should be "that" (`` ``that'' ``)! Notice how `"` will always give the wrong result on the left. When using Computer Modern fonts, `"` gives the right result on the right, but it may not work for other fonts.

And I think that $\tilde{S}$ looks too wimpy. Beef it up with a `\widetilde` to get $\widetilde{S}$.

10. *Read Chapter 18.* Just do it!