SOME LaTeX TRICKS I LEARNED FROM MY COLLABORATORS

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ABSTRACT. We show several LaTeX tricks that we learned over the years, mostly from looking over the shoulders of giants.

CONTENTS

1. GENERAL STUFF

Here are a few tidbits that came to my mind, in no particular order...

I'm sure most people know about `\label` and `\ref`; this feature is enough reason for me to use LaTeX. For example, you might have something like...

Theorem 1.1 (Euler)**.** *Leonhard says* $e^{2\pi i} = 1$.

...which you can then later (or earlier) reference as Theorem 1.1 and you can point to page 1 on which it appears. If you label equations like

$$e^{2\pi i} = 1\,, \tag{1}$$

you can reference them most lazily using (1).

There are two ways to define internal macros: `\def` and `\newcommand`. The difference is that the former overwrites any possibly existing command, where as the latter induces a LaTeX complaint if you're redefining an existing command (in which case you should use `\renewcommand` instead). Since I'm lazy, I tend to use `\def`, with one important exception: `\newcommand` allows you to use arguments. For example, the definition

```
\newcommand\floor[1]{\left\lfloor {#1} \right\rfloor}
```

produces a flexible floor function $\left\lfloor \frac{3\pi}{2} \right\rfloor$. And yes, the `[1]` can be replaced by `[n]` if you have use for `n` arguments (which get the placeholders `#1`, `#2`, ..., `#n`).

The previous example reminds me to strongly recommend the use of `\left` and `\right` whenever you use parentheses:

$$(\frac{a}{b} - 2) \text{ just doesn't look good compared with } \left(\frac{a}{b} - 2\right).$$

There are three dashes in LaTeX—one like the one you just saw, one that's used in "Berndt–Zaharescu's Theorem" or "Chapter 7–9," and one that's used in "well-known identity."

One of my favorite packages is `enumerate`:

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The author thanks his collaborators for enduring his silly LaTeX questions over all these years.

i) first item
ii) second item
iii) third item
iv) ...

TO DO: I stole the idea of a to-do box from a friend. This is useful when editing a paper and you want to remind your co-author or yourself about something...

2. MATH

I'm using the documentclass `amsart` because it comes with some nice features (which ones I've forgotten...). I think one of them is the fact that you can put a □ at the end of a math line if a proof happens to end with a math line. The version...

Proof. This follows from

$$e^{2\pi i} = 1 \, .$$

□

...wastes space and doesn't look nearly as cool as...

Proof. This follows from

$$e^{2\pi i} = 1 \, . \qquad \square$$

Speaking about proofs, sometimes you need a paragraph or two between a theorem and its proof, in which case you can use...

Proof of Theorem 1.1. This follows from

$$e^{2\pi i} = 1 \, . \qquad \square$$

You can (and should) define your own math operators with `\operatorname`. For example,

$$\operatorname{lcm}(2,3) = 6 \ \text{ looks better than } \ lcm(2,3) = 6 \, .$$

Speaking about lcm's, I find it amusing that `\gcd` is a pre-defined operator, whereas `\lcm` is not.

The `\dots` command is relatively smart in LaTeX; e.g., it knows automatically where to put the dots in $\{1,2,\ldots,n\}$ as compared to $1+2+\cdots+n$. If you ever need to force a certain alignment of the dots, use $\ldots$, $\cdots$, $\vdots$, or $\ddots$.

For math stuff that takes several lines I prefer the environment `align` over `eqnarray`. The difference is minor but I still prefer

$$\begin{aligned} \sum_{j=1}^{k-1} \chi(j) \sin^2\left(\frac{\pi j}{k}\right) \tan\left(\frac{2\pi j}{k}\right) &= \sqrt{k}\left(-\frac{1}{2} + (\chi(2)-2)\, h(-k)\right) \\ &= \begin{cases} \sqrt{k}\left(-\frac{1}{2} - 3h(-k)\right) & \text{if } k \equiv 3 \bmod 8, \\ \sqrt{k}\left(-\frac{1}{2} - h(-k)\right) & \text{if } k \equiv 7 \bmod 8 \end{cases} \end{aligned}$$

over

$$\begin{aligned} \sum_{j=1}^{k-1} \chi(j) \sin^2\left(\frac{\pi j}{k}\right) \tan\left(\frac{2\pi j}{k}\right) &= \sqrt{k}\left(-\frac{1}{2} + (\chi(2)-2)\, h(-k)\right) \\ &= \begin{cases} \sqrt{k}\left(-\frac{1}{2} - 3h(-k)\right) & \text{if } k \equiv 3 \bmod 8, \\ \sqrt{k}\left(-\frac{1}{2} - h(-k)\right) & \text{if } k \equiv 7 \bmod 8. \end{cases} \end{aligned}$$

3. GRAPHICS

My favorite way to produce graphics is through a (public-domain) program called `jPicEdt`; it produces a postscript file which TEX can read. A big advantage is that you can insert TEX commands right into the picture, as in Figure 1.

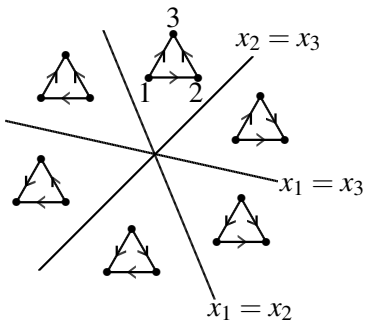

FIGURE 1. The regions of H_{K_3} (projected to the plane $x_1 + x_2 + x_3 = 0$) and their corresponding acyclic orientations.

My second favorite way to go about graphics is through the package `graphicx`. I produce my graphics with a separate program, export them into pdf, and then overlay them with TEX symbols if needed; see Figure 2 for an example.

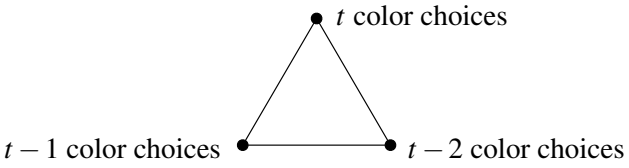

FIGURE 2. Proper t-colorings of K_3.

The overlaying of figures reminds me of two of my other favorite LATEX commands: `\vspace` and `\hspace`. For example, they allow you to place just about

anywhere.

anything

This can be very useful, e.g., for presentations in which you might move pictures around.

4. BIBLIOGRAPHIC STUFF

For references like [1] I recommend using `bibtex`; it means that you have to do only minimal work, especially when you get the entries from *MathSciNet*. I keep all the references I've ever used in the same file and use this in all my documents...

If you could use an index at the end of your document, use `makeindex`—one of best reasons to use LATEX if you're writing a book.

REFERENCES

1. A. I. Borevich and I. R. Shafarevich, *Number theory*, Translated from the Russian by Newcomb Greenleaf. Pure and Applied Mathematics, Vol. 20, Academic Press, New York, 1966. MR MR0195803 (33 #4001)

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