LaTeX Workshop Demo (complete)

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Contents

1 Introduction

This is our LaTeX workshop's complete demo (template here). Here are the associated slides. This demo is heavily inspired by [Baza] and [Bazb].

2 Math formatting

Let's write some expressions involving the number e.

2.1 Math mode (inline)

$e = 2.71828$

2.2 Math mode (display)

$$e = 2.71828$$

2.3 Expressions

$$(1 + \frac{1}{n})^n$$

$$\left(1 + \frac{1}{n}\right)^n$$

$$\lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n$$

$$\lim_{n \to \infty} \frac{n}{\sqrt[n]{n!}}$$

$$\sum_{n=0}^{\infty} \frac{1}{n!}$$

$$\sum_{n=0}^{\infty} \frac{1}{n!} \tag{1}$$

Since we labeled the above equation with `\label{esum}`, we can refer to it with `\ref`, like so: 1.

2.4 Symbols

Some lowercase symbols: $\alpha, \beta, \gamma, \sigma, \rho, \pi$

Uppercase symbols: Γ, Σ, Π

Symbols sometimes look different in inline and display mode even when the code is the same. For example,

$\sum_{i=0}^{n}$

$$\sum_{i=0}^{n}$$

$\prod_{i}$

$$\prod_{i}$$

2.5 How to find symbol

Is there a symbol that you don't know how to write in LaTeX? You could try Detexify [1], but I don't find it that great. Instead, I recommend googling (e.g., "How to type alpha in LaTeX").

2.5.1 Exercise

Exercise 2.5.1: Expressions and symbols

Transcribe the following. If you don't know how to write a symbol in LaTeX, search up how to write it. Once you're done, you can compare with `solutions/expressions.tex`.

1. $\sum_{n=1}^{2024} \frac{1}{n}$
2. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
3. $\frac{\mathrm{d}^2 f}{\mathrm{d}x^2}$
4. $\int_a^b f(x) \,\mathrm{d}x$
5. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

---

[1] Link made possible by \usepackage{hyperref} in the preamble

Solution 2.5.1

1.

2.

3.

4.

3 Text formatting

3.1 Text

Bold, *Italicize*, underline, footnote[2]

3.2 Lists

1. 1
2. 2
3. 3

- 4
- 5
- 6

If you forget the source code for these, you can click $\cdots$ > Bullet list or Numbered List in the Overleaf UI at the top.

3.3 Figures

Click $\cdots$ > Insert Figure > From project files in the Overleaf UI to insert `img/latex.png`.

If we label it with `\label`, we can refer to it using `\ref`, like so 1.

The figure will probably go somewhere unexpected (i.e., some location that isn't where you wrote \begin{figure} because LaTeX decides where it goes. For example, if there isn't enough space on the current page, then the figure will be placed on the next page. Try removing [h] from the above source code, and see where the figure goes.

We can sometimes resolve this with `\begin{figure}[h]`. If that doesn't work, you may have to use `\pagebreak` or other means.

[2]This is a footnote

Figure 1: LaTeX logo

3.4 Tables

Click Insert table at the top of the UI. Similar to figures, tables also may not go where you want without [h] or other means.

1	2	3
4	5	6
7	8	9

Table 1: No lines

You can add lines:

1	2	3
4	5	6
7	8	9

Table 2: With lines

3.5 Comments

Write a comment for your source code using %.

For example, there's an unrendered comment here →

3.6 Escape characters

However, if % denotes a comment, how do we write % in text? Use \to escape the reserved character. And note that \is also reserved, so to write \, this source code uses `\textbackslash`.

3.6.1 Exercise

Exercise 3.6.1: Escape characters

Transcribe the following. Once you're done, you can compare with `solutions/escape.tex`.

1. \$, &, and ~
2. $x = \{1, 2, 3\}$
3. $\text{rain} \implies \text{bring umbrella} \implies \text{use umbrella}$

3 should be done in math mode (for the sake of example), and use `\text` to escape math mode.

Solution 3.6.1

1.
2.
3.

3.7 Code

For inline code, it's good practice to use `\texttt`, which is a monospace code-looking font. For example, `print("hello world")`.

For longer code listings, use the `listings` package. For example,

```
def bogosort(l: list[int]):
    """Bogosorts list of integers"""
    while not sorted(l) == l:
        shuffle(l)
```

See [Oveb] for more information.

4 Define our own formatting

4.1 Environments

When we use `\begin` and `\end`, we enter environments. We can actually define our own environments. For example, see the `\newtheorem` definitions in `preamble.tex`.

Theorem 4.1. *There are no solutions to* $a^n + b^n = c^n$ *for positive integers* $n > 2$.

Proof. Left as an exercise to the reader. □

Theorem 4.2. *P=NP*

Proof. Left as an exercise to the reader. □

Corollary 4.2.1. *All of cryptography*[3] *is broken.*

4.2 Macros

Macros help us automate repetitive tasks.

For example, we normally write $\mathbb{R}$ with `\mathbb{R}`. However, this is tedious to write every time. So, we can define a new command as a shortcut. For example, since we have `\newcommand{\R}{\mathbb{R}}` in the preamble, we can simply write `\R` to display $\mathbb{R}$.

As another example, suppose we want to implement a macro for column vectors. We can write a column vector using `bmatrix` (even inline). For example, $\begin{bmatrix}0\\1\end{bmatrix}$. However, this is a lot to type. So, check out the macro for `\cv` in the preamble. Now, `\cv{0}{1}` outputs $\begin{bmatrix}0\\1\end{bmatrix}$.

5 Bibliography

We can add a bibliography using the package `biblatex` and a `.bib` file.

See the `biblatex` import in `preamble.tex`. Also see `refs.bib`. You can cite a source using `\cite`, like so [Baza] [Bazb]. Then, use `\printbibliography` to place the bibliography.

Note that if a source from the `.bib` file is not cited, it will not appear in the document.

See [Ovea] for more information.

[3] except OTP

References

[Baza] Trefor Bazett. *Intro to LaTeX : Learn to write beautiful math equations —— Part 1*. URL: https://www.youtube.com/watch?v=JpOlPj2-DQA. Accessed 03/26/2024.

[Bazb] Trefor Bazett. *Intro to LaTeX **Full Tutorial** Part II (Equations, Tables, Figures, Theorems, Macros and more)*. URL: https://www.youtube.com/watch?v=-HvRvBjBAvg. Accessed 03/26/2024.

[Ovea] Overleaf. *Bibliography Management in LaTeX*. URL: https://www.overleaf.com/learn/latex/Bibliography_management_in_LaTeX. Accessed 03/26/2024.

[Oveb] Overleaf. *Code listing*. URL: https://www.overleaf.com/learn/latex/Code_listing. Accessed 03/26/2024.