A primer on LaTeX

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Contents

1 Introduction

We are going to construct now a template or sample document which covers the main tools that one needs to produce a complex LaTeX document. Most of the things that you will ever need and many more are covered throughly in [2]. In the next lecture we are also going to cover some more advanced material to understand how the internals of LaTeX work. This is rarely used directly but it helps to understand why LaTeX does things the way it does and it saves time. All the details can be found in the book by the father of TeX, D. Knuth [1].

2 The Preamble

About the encodings and how to use them. I can type é í ó without trouble.

3 Title and other headings

This formatting depends on the class, as many others. Typically the style and macros used to define the headings of the document depend on the journal or editorial where you will publish the document. The article class (as well as book and report) include a simple way of producing this heading. There are some macros like \author, \title, \date which then are transformed using the \maketitle command. In the article class the \maketitle needs to be included after the \begin{document} statement. The rest of the macros will go typically in the preamble. Check how they are used in the source file.

4 Table of contents

5 Mathematics in a Document

5.1 The math modes and the text mode

Typesetting mathematics in a document was one of the reasons why TEX and later LATEX was created. There are two types of math modes inline mode and displayed mode. Inline mode is when an equation or mathematical expression is embedded in the text, $\sum_{j=1}^{n=10} x^j$, like this one. It is included in the source text with the symbol $. A single $ starts the inline math mode and another $ ends it. Another way of inserting math in the inline mode is surrounding it with the symbols \(, \), like here $\lim_{x\to\infty} f(x) = 7$. The math mode and the text mode have many differences. For instantes, regular latin characters are displayed in italics and spaces are ignored $Thisismathmode$. Display mode can be called using double dollar symbols $$,$$ or enclosing it with \[, \] like here

$$\sum_{j=1}^{n=10} x^j$$

or

$$\lim_{x\to\infty} f(x) = 7.$$

As opposed to inline math mode, the displayed mode prints the mathematical expression in a separated line. Wether this equation is centered, right aligned or left aligned depends on the class and styling. Notice that there are differences in how the math is typeset in the two modes. The inline mode is more compact and sub and superscripts are placed at different positions.

5.2 Some environments useful for presenting equations

$$\int_{\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi} \tag{1}$$

I can point to the equation 1.

$$
\begin{aligned}
(a+b)^2 &= a^2 + 2ab + b^2 && (2)\\
&\geq 0 && (3)\\
&> -x^2 + 5
\end{aligned}
$$

$$
\begin{aligned}
(a+b)^2 &= a^2 + 2ab + b^2\\
&\geq 0\\
&> -x^2 + 5
\end{aligned}
$$

5.3 Tabular math

$$
A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}
$$

$$
f(x) = \begin{cases} \exp\left(-\frac{1}{x}\right) & , \text{if } x > 0 \\ 0 & , \text{if } x \leq 0 \end{cases}
$$

6 Tables in text mode. The tabular environment

One can produce tables in latex. We will speak about the basic functionality. The functionality can be extended by using packages that can be loaded in the preamble.

Aligned lef	An Oak	Aligned right	An Oak
$\emptyset$	Centered	$\emptyset$	Centered
$\emptyset$	$\emptyset$	$\emptyset$	$\emptyset$

7 List environments

- First element
- Second element

1. First element
2. Second element

1. First element
   (a) element 1.1
      i. element 1.1.1
      ii. element 1.1.2
      iii. element 1.1.3
   (b) element 1.2
2. Second element

The labels of the nested enumerate environment can be changed. This is done with the special commands

b
iii
II

1. First element
   (I) element 1.1
      i. element 1.1.1
      ii. element 1.1.2
      iii. element 1.1.3
   (II) element 1.2
2. Second element

1. First element
   I]] -> element 1.1
      i. element 1.1.1
      ii. element 1.1.2
      iii. element 1.1.3
   II]] -> element 1.2
2. Second element

We will see more functionality of the command \renewcommand. This is very useful and a must-to-know for every LaTeXuser.

8 Changing Fonts in a LaTeXDocument

- Series
  - Bold; **I am Bold**; **I am bold**
  - Medium(default); I am normal; I am normal ; I am normal
    This is bold this is not
- Family
  - Serif font (default); Here am I ; Here am I;
  - Sans Serif font; Here am I; Here am I
  - Typewriter font; `text`; `Here am I`
- Shape
  - upright (default); Normal; also normal
  - slanted/italics; *I am in italics*; *Also in italics*
  - small caps: I am In Small Caps; i am Also

You can mix the three properties, some particular combinations might not be available: Hello *`Hello`* *Hello* **Hello** **Hello** `Hello`

9 Defining macros

$\mathbb{R}$

Commands with arguments

$\langle A \rangle$

$\frac{\text{Numerator}}{\text{Denominator}}$

10 Including Graphics

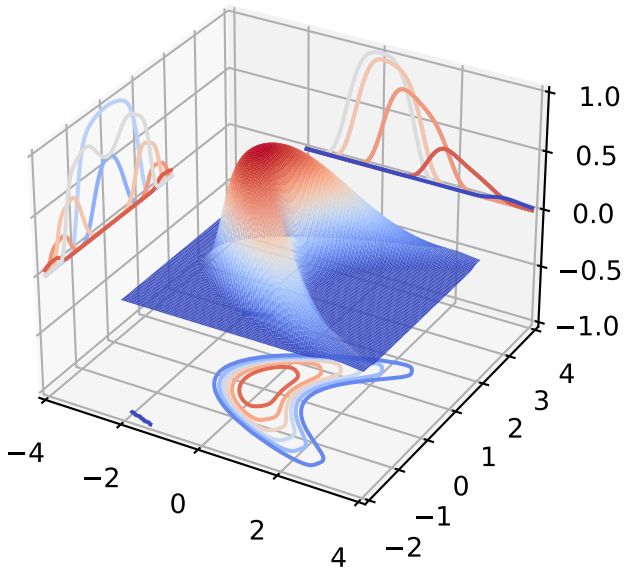

Figure 1: Some descriptive text

11 Defining a bibliography with 'Bibtex'

We have referenced the bibliography previously, like here [3]. With LaTeX one can use an automated tool to generate the bibliography, this is called 'Bibtex'. For doing it one needs to include the two statements that can be found after this paragraph. The source document needs to be parsed several times to complete the process. This is so because first one needs to know which references in the '.bib' file are cited in the document. Then a formatted bibliography file '.bbl' is created. Then the bibliography file is read and included in the document. Finally you need to run latex again to get the references properly. In summary,

whenever you add some \cite references to the document you need to compile with latex, then 'Bibtex' and then with LaTeX two times again.

References

[1] D. Knuth, *The TexBook*, Addison-Wesley, 1990.

[2] F. Mittelbach and M. Goossens, *The LaTex Companion*, Addison-Wesley, 2nd edition ed., 2004.

[3] M. Stone, *On one-parameter unitary groups in hilbert space*, Annals of Mathematics, 33 (1932), pp. 643–648.