EXAMPLE OF A LaTeX DOCUMENT

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Abstract. This is an example of a LaTeX document.

Contents

1. Introduction

1.1. Definition Tests.

$$\mathbb{RCA}\smallsetminus\frac{-1}{2}\varepsilon^{-1}\frac{\partial}{\partial[x]}$$

1.2. **The Real Introduction.** The goal of this document is to show some of the ways to use LaTeX. We recommend that you make a copy of this file and play with it, to see how the different options work. We start by quoting Audin –

> Always begin by quoting a famous mathematician.

Also notice how to *emphasize* text or to put it in **boldface**. Or how to skip a line:

And how to to handle spaces such as here or here or here.

We thank UTM for the opportunity to deliver this course.

Use \ to create a single space (e.g. if you have an "e.g." in the middle of a sentence and you don't want LaTeX to put a longer space after it as it does after a period at the end of a sentence).

2. Formulas and math symbols

Use single dollar signs for an equation embedded in text, such as when asserting that the circumference of a circle of radius r is $2\pi r$. Notice the difference between the product *wlog* and the phrase wlog.

Use double dollar signs for an un-numbered displayed equation:

$$1 + \ldots + n = \sum_{k=1}^{n} k.$$

Also,

$$n! = \prod_{k=1}^{n} k \quad \text{and} \quad \int_0^\infty r e^{-r^2} dr = \frac{1}{2} e^{-r^2} \Big|_0^\infty .$$

Also,

$$\lim_{x \to \infty} f(x) = 1,$$

or

$$f(x) \xrightarrow[x \to \infty]{} 1.$$

If your text contains the dollar sign, percent sign, or curly brackets, use backslash, e.g., in \$10, or \%10, or \{ here \}.

3. Theorem-like environments

In this section we present some theorem-like environments. We chose to enumerate them consecutively ("Theorem 1, Example 2, Definition 3 ...") in order to make it easier for the reader to navigate.

Theorem 1. *Consider a quadratic equation $ax^2 + bx + c = 0$, where $a, b, c \in \mathbb{R}$ and $a \neq 0$. The solutions to this equation are*

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Proof. Because $a \neq 0$, we divide through by a and get

$$x^2 + \frac{b}{a} x + \frac{c}{a} = 0.$$

The solution to this equation are the same as those of the original equation. Completing the square, we re-write this equation as

$$\left(x + \frac{b}{2a} \right)^2 - \frac{b^2}{4a^2} + \frac{c}{a} = 0.$$

Adding $\frac{b^2-4ac}{4a^2}$ and taking square roots, we get

$$x + \frac{b}{2a} = \pm\frac{\sqrt{b^2-4ac}}{2a},$$

which yields the required formula. □

Here are more examples of theorem-like environments:

Example 2. One of the two solutions to the equation $x^2 - x - 1 = 0$ is the golden ratio, $x = \frac{1+\sqrt{5}}{2}$.

Definition 3. A *square root* of α is a number whose square is equal to α.

Proposition 4. *Check out the LaTeX source that created this proposition!*

Corollary 5. *The name of the theorem in the source can be different from the name that shows in the output.*

Theorem-like environments can also come without numbers:

Proposition. *This proposition has no number.*

4. Labels, cross references, and citations

We can put a label on a theorem-like environment, and we can later refer to it according to this label. For example, check the source to see how we now refer to Definition 3.

We can also refer to sections; for example, this section is Section 4.

Remark 6. For cross-references to come out right after a recent source changes, run the latex program twice.

To create a labeled equation or formula, to which we can later refer using its label, we use the "equation" environment:

$$a_n x^n + a_{n-1}x^{n-1} + \ldots + a_1 x + a_0. \tag{4.1}$$

See how we now refer to the Equation (4.1) in this source of this file.

You can find many other options at [1, 2, 3][1], or simply through "google". Google is great! Try, e.g., to search "latex font size".

[1]Notice how we cite references!

5. Lists

Thumb-rule for writing:

(1) Tell the reader what you're going to say.
(2) Say it.
(3) Tell the reader what you just said.

Use

- "Enumerate" for a numbered list;
- "itemize" for an un-numbered list;
  - you can indent lists,
  - such as here.

6. Cases; matrices

The following text is produced with the "cases" environment:

$$|x| := \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$$

The *characteristic polynomial* of the 3×3 matrix

$$T := \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$$

is $\lambda \mapsto \det(\lambda I - T)$.

7. Tables

This example shows how to create a simple table in LaTeX. It is a three-by-three table, but without any lines.

1 2 3
4 5 6
7 8 9

Add some lines, as well as centering (notice the use of the center environment):

1	2	3
4	5	6
7	8	9

7.1. **Rows spanning multiple columns; Columns spanning multiple rows.** The first thing you need to do is add

`\usepackage{multirow}`

to the preamble.

The command for this looks like this:

`\multicolumn{num_cols}{alignment}{contents}.`

num_cols is the number of subsequent columns to merge; alignment can be l, c, r. And contents is simply the actual data you want to be contained within that cell.

`\multirow{num_rows}{width}{contents}.`

The arguments are pretty simple to deduce (* for the width means the content's natural width).

An example:

Team sheet		
Goalkeeper	GK	Paul Robinson
Defenders	LB	Lucus Radebe
	DC	Michael Duberry
	DC	Dominic Matteo
	RB	Didier Domi
Midfielders	MC	David Batty
	MC	Eirik Bakke
	MC	Jody Morris
Forward	FW	Jamie McMaster
Strikers	ST	Alan Smith
	ST	Mark Viduka

8. Figures

Last but not least a simple example that shows how to include a figure saved in eps format.

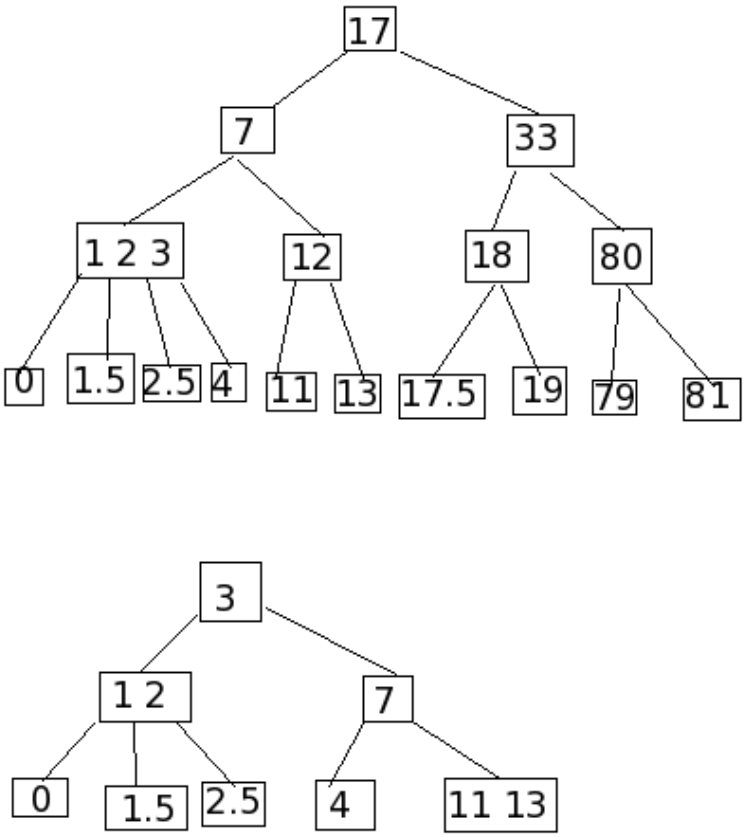

Figure 1. Deletion in a B-tree

The figure itself does not look very nice. A very useful to draw figures is Ipe[2] by Otfried Cheong. Ipe is a drawing editor for creating figures in PDF or (encapsulated) Postscript (eps/ps) format. It supports making small figures for inclusion into LaTeX-documents as well as making multi-page PDF presentations that can be shown on-line with Acrobat Reader.

Conclusion

We hope that you find this document helpful. If you have suggestions for improvement, please let us know.

[2] `http://ipe7.sourceforge.net/`

References

[1] Leslie Lamport, *LaTeX: A Document Preparation System*. Addison Wesley, Massachusetts, 2nd Edition, 1994.

[2] Tobias Oetiker, Hubert Partl, Irene Hyna, and Elisabeth Schlegl, *The Not So Short Introduction to LaTeX2E*, `http://tobi.oetiker.ch/lshort/lshort.pdf`.

[3] Scott Pakin, *The Comprehensive LaTeX symbol list*, `http://www.ctan.org/tex-archive/info/symbols/comprehensive/symbols-a4.pdf`

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