Workshop LaTeX Cheat Sheet

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1 Introduction

What is LaTeX?

- It differentiates itself from Word and Libre Office because it is not a WYSIWYG (What you see is what you get) system. This means that we have a source code file that does not represent the end result. We visualize the PDF in a separate viewer.
- Several functionalities can be added via packages, which can be installed (and then included in each specific file) as the need arises.

This document is organized as follows: Section 2 is dedicated to math expressions, Section 3 to text formatting, Sections 4 and 5 to images and tables respectively, and Section 6 to plotting and graph drawing with Ti*k*Z. The document ends with Section 7 with some miscellaneous commands and useful links.

2 Math Expressions

LaTeX is very often used as a typesetting language for mathematics, due to its ease of use. To write simple expressions, we just need to write them in between dollar signs, like so: $1 + 1 = 2$. If we do not wish to write the math expression inline, we can also use double dollar signs:

$$x = y + 3$$

Furthermore, we can get more control if we use the equation environment, from the `amsmath` package.

$$\sum_{i=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6} \tag{1}$$

With environments such as these, we can then refer to specific equations, such as Equation 1. To be able to do so we need to define a label within the environment through the `\label`, which is then used in the `\ref` command.

Fractions can be easily written using the `\dfrac{}{}` command, as seen in the example above. The command also requires the `amsmath` package. Further math commands can be easily found online, for example at Wikibooks.

3 Text Formatting

It can be useful to format the text, and the standard ways of doing so are readily available: **bold**, *emphasize*, underline. To do a linebreak, both the command `\linebreak` and the command `\\` do the same thing[1].
There are some nuances when using LaTeX. For example, if we wish to use quotation marks, we must start the expression with two grave accents and end it with two apostrophes. ”Wrong” and “Right”. Also, we need to be careful with special characters in text, as they need to be prefixed by a backslash: 10%.

We can also create lists, with the itemize command:

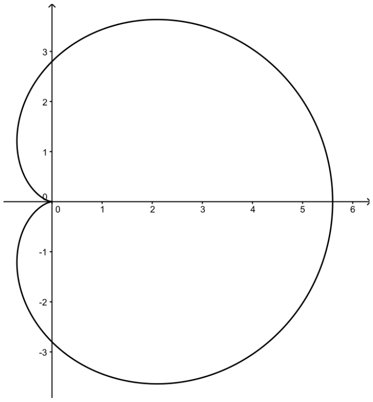
- Where we can write
- $x \times y = 1$

And with the enumerate command, the items are numbered:

1. One
2. Zwei
3. Trois

4 Insert Images

With the `graphicx` package, inserting images is straightforward.



Using the `\includegraphics[]{}` command, we can control the images' size with the square brackets, and the image itself goes in the curly brackets. If we create a folder to store the images (which is a good

[1] Also, this is how to create a footnote.

practice to have an organized workspace), then the directory has to be included. In our example, we have a file “Cardioid.png” in the Images folder. So we need to use `Images/Cardioid.png`. To center the image, we have the `\centering` command.

As with math expressions and the equation environment, images also have an environment that allows us to have more control over them, called figure. For example, we can specify the position of the figure. The standard options are h, t, b, and p, which stand respectively for here, top, bottom, and page of floats. They mean that the figure should be placed exactly where it is written in the text, at the top of the next page, at the bottom of the next page, and in a page of floats, separate from the text. These options can sometimes be ignored by LaTeX, but if one really wants them to be enforced, using “!h” instead of just “h” may be able to override this. For more on this topic see placement specifier parameter.

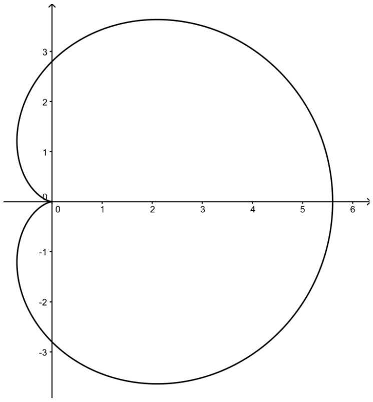


Figure 1: A beautiful caption for a beautiful cardioid.

Just like we did for equation, we can also refer to a specific figure, for example, figure 1. Some of these environments also allow us to provide a caption, through the `\caption` command.

Notice that we use ˜ in-between figure and its reference, the tilde creates a “non-breaking space” meaning it creates a space that cannot be affected by a line break.

5 Tables

Aside from what we presented, we can also create tables. Like with math expressions and graphics, we can use the `\tabular` environment from the `tabularx` package for creating a simple table, but it is generally preferable to use `\table`, also due to the greater control over the tabular.

Horizontal lines are added with `\hline`, and the number of columns and placement of vertical lines are defined when beginning the tabular. For example, `\begin{tabular}{|c c | c|}`, assuming everything else is completed correctly, defines a table with 3 columns and vertical lines before the first column, between the second and the third, and after the third column.

In table 2 we present a modified version of the table 1. We removed horizontal lines by removing two `\hline` commands, as well as some vertical lines by changing the tabular parameter given when beginning the tabular environment `\begin{tabular}{c|cc|c|c}`.

More advanced tables can be created using the commands `\multirow` and `\multicolumn`, which require the packages `multirow` and `multicol`.

×	**1**	**i**	**j**	**k**
1	1	i	j	k
i	i	-1	-k	-j
j	j	-k	-1	i
k	k	j	-i	-1

Table 1: Quaternion multiplication table

×	**1**	**i**	**j**	**k**
1	1	i	j	k
i	i	-1	-k	-j
j	j	-k	-1	i
k	k	j	-i	-1

Table 2: Quaternion multiplication table (modified)

Test	Note Code		
	A	B	C
-1	0	1	2
0	12	13	14
1	24	25	

Table 3: Testing a table with some peculiarities

6 TikZ

TikZ example The `tikz` package allows us to plot functions like the one in figure 2. But it can also be used to create graphs, as the one in figure 3, and many other kinds of diagrams. See more on the webpage Ti*k*Z.

7 Miscellaneous

Comments: Comments can be added with a `%` (percentage symbol), anything written after one will be ignored and not presented in the resulting PDF, remaining present in the source code only.

Hyperlinks: For adding hyperlinks, as we have been using throughout the text, we use the `\href` command. It requires the `hyperref` package An example of a hyperlink for more information on the subject of Hyperlinks.

Macros: One can create commands to achieve numerous effects. One of the most commonly used is to facilitate the usage of other commands that are frequently used. For example, to replace the command `\mathbb{N}`, we can create a command `\N` adding the following in the preamble `\newcommand{\N}{\mathbb{N}}`. And then we can simply use $\mathbb{N}$.

This example serves as a simple illustration, we would not usually create macros that are essentially copies of other commands. But instead, we would use it for longer and more detailed commands that we use often.

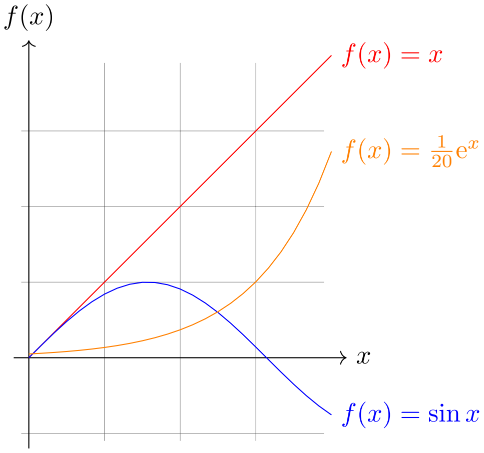


Figure 2: Plotting functions with Ti*k*Z

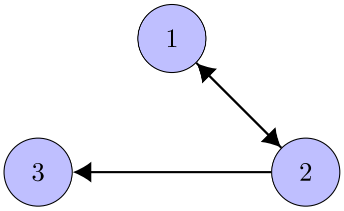


Figure 3: A Graph made with Ti*k*Z

Resources:

- TeXstudio is our recommendation to start playing around with LaTeX;
- Overleaf is a good tool for collaborative work (especially in real-time);
- Learn LaTeX is a well-structured website for in-depth learning of how LaTeXworks.