1 Section Title Here

This is the beginning of a section.

The overriding principle of \LaTeX is that the \textit{input file} (\texttt{\textbf{\	exttt{emph}\{\ldots\}}} emphasizes the text in the argument) should be easy to read; the system takes care of all formatting decisions!

In the following, I keep using the \texttt{\texttt{\texttt{verb}}} command; it quotes the text between the plus signs verbatim.

1.1 Subsection Title Here

Here, you see how a mathematical equation can be generated inline, for instance \( f(x) = \frac{1}{1+25x^2}. \) The $\$-symbols enclose the formula. As a so-called displayed formula, it would look like

\[
f(x) = \frac{1}{1+25x^2}.
\]

It is customary that mathematical functions are \textit{not} set in math-italics, so \LaTeX has the basic ones pre-defined; you should use the commands \texttt{\texttt{\texttt{\texttt{cos}}}}, \texttt{\texttt{\texttt{\texttt{exp}}}}, etc. to get \( f_1(x) = \cos x, \)

\( f_2(x) = -e^x \sin^2 x, \) etc.

Here, I use some of my commands defined above: I like \( \varepsilon = \varepsilon \) better than the default \( \epsilon. \) A partial derivative (with 2 arguments) would be obtained as follows. If \( f(x,y) = x^2y^3, \)

then

\[
\frac{\partial f}{\partial x} = 2xy^3, \quad \frac{\partial f}{\partial y} = 3x^2y^2.
\]

1.2 Sums and Integrals

When you say "capital sigma," you probably did not really mean \( \Sigma, \) but rather a summation symbol. You would get that as in

\[
\sum_{i=0}^{\infty} r^i = \frac{1}{1-r} \quad \text{for all } |r| < 1.
\]

Finally, we have

\[
\int_0^1 \sin(2\pi x) \, dx = 0
\]

and

\[
\int \int f(x)g(y) \, dx \, dy = \int f(x) \, dx \int g(y) \, dy.
\]

Here, \texttt{\texttt{\texttt{,}}} gives a small space, while \texttt{\texttt{\texttt{!}}} forces things closer together; you have to work on the proper spacing for integrals, as \LaTeX does not understand, what is going on.
1.3 Matrices in \LaTeX

A matrix \( A \in \mathbb{R}^{m \times n} \) could be defined by

\[
A = \begin{pmatrix}
11 & 12 & 13 & \cdots & 1n \\
21 & 22 & 23 & \cdots & 2n \\
\vdots & \vdots & \vdots & \ddots & \vdots \\
m1 & m2 & m3 & \cdots & mn
\end{pmatrix}
\]

Here, the word \texttt{dots} in the commands stands for an ellipsis (i.e., three dots) placed horizontally in the center (\texttt{\cdots}), vertically (\texttt{\vdots}), or diagonally (\texttt{\ddots}); what is not mentioned is \texttt{\ldots} for horizontal dots at the baseline. Use the baseline or central version as appropriate, for instance

\[
a_1, a_2, \ldots, a_n \quad \text{and not} \quad a_1, a_2, \cdots, a_n,
\]

\[
a_1 + a_2 + \cdots + a_n \quad \text{and not} \quad a_1 + a_2 + \ldots + a_n,
\]

Some more comments on the matrix are needed, I suppose: The \texttt{\left(} and \texttt{\right)} create the variable-sized parenthesis around the actual array of terms. You can also use \texttt{\left[} and \texttt{\right]}, or \texttt{\left\{} and \texttt{\right\}} in other situations. The actual array arrangement is organized by the \texttt{array} environment; you need the arguments \texttt{ccccc} to indicate that there are five columns and you want the entries centered (“c”), other options are left (“l”) and right (“r”). Notice how \& separate columns and \\ the rows.

2 Further Reading

2.1 This document

This document is written with the intention that you also read the source code; indeed, many statements will only then make sense. The source of this file can be downloaded from the homepage of this course, following my homepage \url{http://www.math.umbc.edu/~gobbert/}. Furthermore, I strongly recommend the following books in the reference list, all of which are well-written and recognized standards.

References


[2] Michel Goossens, Frank Mittelbach, and Alexander Samarin, \textit{The \LaTeX Companion}, Addison-Wesley, 1994. If you want to change \LaTeX’s internal settings, this book is unavoidable; not needed for a novice.