Extensive Guide to LaTeX

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If you come across any problems, see section 14 for possible solutions or contact me at armindubert19@gmail.com

Happy LaTeX-ing!

Table of Contents

1 Brief Introduction to Latex **2**

1.1 Downloading Tex Studio . . . 2
1.2 Source Code and Resume Templates . . . 2
1.3 LaTeX Files . . . 2
1.3.1 LaTeX Commands . . . 3
1.4 General Items . . . 3
1.5 Terminology to Know . . . 3
1.6 Tex Studio Commands . . . 3
1.7 Creating Templates . . . 3

2 Including and Inputing other Files **5**

3 Creating Your Document (Classes) **6**

3.1 Lessons . . . 6
3.2 Exams . . . 6
3.3 Lesson and Exam File Structure . . . 7
3.4 Normal Classes . . . 7
3.4.1 General Structure of Normal Documents . . . 7
3.5 Beginning Document . . . 7
3.6 Sections and Chapters . . . 7
3.6.1 Alternate Sectioning . . . 8

4 Spacing and Layout **9**

4.1 Geometry Package/Layout of the Document . . . 9
4.2 Centering . . . 9
4.2.1 Single-Line . . . 9
4.2.2 Multi-Line . . . 9
4.3 Spacing and New Pages . . . 10
4.3.1 Inserting Horizontal and Vertical Space . . . 10
4.3.2 Page and Line Breaks . . . 10
4.3.3 Indenting . . . 10
4.3.4 Line Spacing . . . 10
4.3.5 Math Spacing . . . 11
4.4 Margin Notes . . . 11
4.4.1 Adjusting the Width of a Margin Note . . . 11

5 Tests/Exams **12**

5.1 Math Environments . . . 12
5.2 Structuring . . . 12

5.3 Writing Exams . . . 13
5.3.1 Questions . . . 13
5.3.2 Choices . . . 13
5.3.3 Displaying Solutions . . . 13
5.3.4 Source Code - Questions . . . 14
5.3.5 Source Code - Questions with Image on the side . . . 14
5.4 Math Commands . . . 14

6 List of Already Defined Environments and Macros 15
6.1 Main Box Environments . . . 15
6.1.1 Theorems . . . 15
6.1.2 Boxes for Definitions . . . 15
6.1.3 Boxes for Examples . . . 16
6.1.4 Boxes for Discussions . . . 16
6.1.5 Boxes for Visualizations . . . 16
6.2 Extra Box Environment . . . 16
6.3 Extra Box Commands . . . 21
6.4 Commands (Macros) . . . 21
6.5 How to Define New Commands (Macros) and Colors . . . 21

7 Inserting Graphics 22
7.1 Easiest Way to Insert Images . . . 22
7.2 Graphics Path . . . 22
7.3 Inserting Images . . . 23
7.4 Image Additions . . . 23
7.5 Positioning an Image . . . 23

8 Font Styles 24
8.1 Font Types . . . 24

9 Referencing and Documentation 25
9.1 References/Hyperlinks and Formatting . . . 25
9.2 Documentation . . . 26
9.3 Verbatim . . . 26
9.4 Source Code for the Documentation Style used in this PDF . . . 27

10 Common Symbols and Functions 28
10.1 Functions . . . 28
10.2 Limits, Integrals, Sums, and Fractions . . . 29
10.2.1 Symbols . . . 29

11 Bibliography **30**
11.1 Bibliography Source Code 31

12 Miscellaneous **32**
12.1 Rule 32

13 Some Common Errors **33**

14 Further Reading **34**
14.1 Websites and Tutorials 34
14.2 Introduction/Commands/and Overall Good References 34
14.2.1 Writing First Document 34
14.2.2 Brief Introduction/List of Commands 34
14.2.3 In-Depth LaTeX Guide 35
14.3 Boxes 35
14.4 Typesetting Math Documents 35
14.4.1 Creating Math Documents 35
14.4.2 Symbols 35
14.4.3 Typing Math Functions/Equations 36
14.5 Graphics 36
14.5.1 Images 36
14.5.2 Colors 36

28 References **38**

About This File

This file was created for the benefit of all teachers and students wanting to use Latex for tests/exams/lessons/thesis/articles etc.
The entirety of the contents within this file, and folder, are free for public use.

1

SECTION

Brief Introduction to Latex

LaTeX, which is pronounced «Lah-tech» or «Lay-tech», is a document preparation system for high-quality typesetting. It is most often used for medium-to-large technical or scientific documents but it can be used for almost any form of publishing.
When using Latex, ***make sure to keep your source code organized by indenting and using sections/chapters/subsections***. Not keeping your source code organized makes it harder to fix possible errors in your code.

1.1 Downloading Tex Studio

Latex is free to download and is available on all types of operating systems. To download LaTeX, click the url to the right: https://www.texstudio.org/

1.2 Source Code and Resume Templates

If interested in obtaining the source code for this guide, see:
https://sourceforge.net/p/latex-source-code/wiki/Download/
If interested in obtaining some of the resume templates I have created, see:
https://sourceforge.net/p/latex-resume-template/wiki/download/

1.3 LaTeX Files

LaTeX files have names that end with the extension .tex: for example, an acceptable file name might be myfile.tex. (Never use spaces in file names.) The input file contains both the

text of your document and the LATEX commands needed to format it. The first command in the file, `\documentclass`, defines the style of the document.

1.3.1 LaTeX Commands

To distinguish them from text, all LATEX commands (also called control sequences) start with a backslash `\`. A command name consists of letters only and is ended by a space or a non letter.

1.4 General Items

`\usepackage`

Packages in latex allow for the user to include cool and unique features into ones document. Most packages for latex will be found on www.ctan.org

```
\usepackage{package}
```

1.5 Terminology to Know

- Preamble: All the code that precedes your `\begin{document}`. The preamble section of your document is where all the formatting takes place.
- Commands: Commands are special words that determine LATEXbehavior.
- Environments: Environments are used to format blocks of text in a LATEXdocuments

1.6 Tex Studio Commands

- The button with the magnifying glass, labeled view, in the top part of Tex Studio allows you to view your document sidebyside with your code.
- The green arrows next to the magnifying class, labeled compile, allows you to update your document with any new code you include. Compiling also allows you to check if there are any errors in your code.

1.7 Creating Templates

One of the many great things about LATEX is that offers many ways to avoid some of the repetitive things that come with creating several documents. One of the features LATEX offers is to create personal user templates for files that a user often uses but does not want to continuously type out every time.
For example, lets say you wanted to save a general layout of a lesson document that included **both** the preamble and some of the actual text and commands in the document. To create the template, one would first proceed to the folder originally containing this pdf (The Contents You Downloaded from the Zip File)) and then go to the folder labeled **Files to make Templates out of**. Once there, click the file named: **Lesson Template**. Once you have opened that file in texstudio, go to **File**, then **Make Template**. Once that is done, give the

template a name and then press ok.
After creating a template, all a user needs to do to use that template is to go back to **File**, and then **New From Template** and then click the template you created.

2

SECTION

Including and Inputing other Files

`\input{`*file-name*`}`

Imports the commands from filename.tex into the target file; it's equivalent to typing all the commands from filename.tex right into the current file where the `\input` line is.

`\include{`*file-name*`}`

The `\include` macro is bigger and is supposed to be used with bigger amounts of content, like chapters, which people might like to compile on their own during the editing process.

If you would like to get a better understanding on the difference between the `\include` vs `\input` command, then I would suggest checking out the following website:
https://tex.stackexchange.com/questions/246/when-should-i-use-input-vs-include

SECTION 3

Creating Your Document (Classes)

The following provides you with the preamble/formatting for lessons and exams as well as how to organize your code and document.

3.1 Lessons

```
\input1{lesson}
```

Replace \input1 with \input

This command provides all the formatting you need to create a lesson document.

3.2 Exams

```
\input2{examMC}
```

Replace \input2 with \input

This command provides all the formatting you need to create a Multiple Choice Exam. On how to add questions and fully write a Multiple Choice Exam, see section 5.3 on page 13 and section 14.4 on page 35

```
\input3{examFR}
```

Replace \input3 with \input

This command provides all the formatting you need to create a Free Response Exam. On how to add questions and fully write a Free Response Exam, see section 5.3 on page 13 and section 14.4 on page 35

3.3 Lesson and Exam File Structure

When using either the lesson or exam formats, use the following structure when creating your document:

```
\input{lesson}
\begin{document}
Text
\end{document}
```

3.4 Normal Classes

For situations when you do not want to use one of the pre-created/defined classes, you can begin your document with `\documentclass{"type of document"}`.

3.4.1 General Structure of Normal Documents

Usually most Latex Files will follow the following format:

```
\documentclass{class}
\emph{Preamble}
\begin{document}
\emph{Text}
\end{document}
```

3.5 Beginning Document

\begin{document}
⟨*text*⟩
\end{document}

This is environment is need to insert text in the document.

3.6 Sections and Chapters

Below are the 7 ways to section your document.

```
\part{name}
```

```
\chapter{name}
```

```
\section{name}
```

```
\subsection{name}
```

```
\subsubsection{name}
```

```
\paragraph
```

```
\subparagraph
```

3.6.1 Alternate Sectioning

```
\section*{Terminology}
```

The following command removes the chapters/section/numbers next to the section. In addition to removing the numbers from the left side of the section, it also removes the section from the table of contents.

4

SECTION

Spacing and Layout

4.1 Geometry Package/Layout of the Document

The geometry package inside latex allows you to change the margins and layout of the document.

```
\newgeometry{left= mm, right= mm, top= mm, bottom= mm}
```

This command allows you to change the margins and layout for that page and ones that come after it. This allows you to change the margins mid-document.

4.2 Centering

4.2.1 Single-Line

If you have only one line to center, it's easiest to use the plain TEX command `\centerline`; for example:

```
\centerline{This line will be centered}.
```

4.2.2 Multi-Line

If you have several lines to be centered horizontally, the center environment is convenient. Make sure when using this environment, to use the line break, see- 4.3.2

```
\begin{center}
  ⟨text⟩
\end{center}
```

4.3 Spacing and New Pages

4.3.1 Inserting Horizontal and Vertical Space

`\vspace{distance}`

This command allows you to insert a vertical space the distance that you specify in the brackets between items.

`\hspace{distance}`

This command allows you to insert a horizontal space a certain distance that you identify between items.

`\vfill`

This command inserts vertical white space spanning the current point on the page all the way down. Great if you want to include something on the bottom of the page but not quite a footer.

4.3.2 Page and Line Breaks

`\newpage`

This command forces a page break at that point in the text.

The following command is how to terminate a line/force a line to break:

```
\\
```

4.3.3 Indenting

`\noindent`

This commands allows you to prevent text from being indented.

`\indent`

Similarly, this command allows you to force the text to indent.

4.3.4 Line Spacing

If you want to use larger inter-line spacing in a document, change its value by putting the

```
\linespread{factor}
```

command into the preamble of your document. Use `\linespread{1.3}` for "one and a half" line spacing, and `\linespread{1.6}` for "double" line-spacing. Normally the lines are not spread, so the default line spread factor is 1. Note that the effect of the `\linespread` command is rather drastic.

4.3.5 Math Spacing

`\quad`

Creates a horizontal space equal to the current font size (= 18 mu)

`\;`

5/18 of `\quad` (= 3 mu)

`\:`

4/18 of `\quad` (= 3 mu)

`\,`

3/18 of `\quad` (= 3 mu)

4.4 Margin Notes

The package labeled margin notes contained within the folder holding this file allows for the user to write text in the margins.

`\marginnote{`*text*`}[`*distance offset*`]`

This command inserts a note in the margin on the right hand side. When using the margin note, remember to use the line break command: Also remember to specify and adjust the vertical offset of the margin note.

`\reversemarginpar\marginnote{`*text*`}`

This command with the reverse marginpar creates a note in the margin on the left hand side of the document.

Insert the text for the marginnote in place of `{`⟨*text*⟩`}`.

4.4.1 Adjusting the Width of a Margin Note

`\marginparwidth`

This command allows you to specify the width you would like the margin to be. Input this in the geometry command in your preamble or typing `\newgeometrymarginparwidth=distance`

`\marginparsep`

This allows you to specify the distance between the margin note and the main text. Input this in the geometry command in your preamble or typing `\newgeometrymarginparsep=distance`

SECTION

5 Tests/Exams

5.1 Math Environments

\begin{displaymath}
  ⟨*text*⟩
\end{displaymath}

Environment for equations that are on their own line and centered. In the displaymath environment no equation number is added to the math text. One way to get an equation number is to use the equation environment

\begin{equation}
  ⟨*text*⟩
\end{equation}

Similar to the displaymath environment, such adds a equation number on the right side of the document.

\begin{math}
  ⟨*text*⟩
\end{math}

For formulas that appear right in the text.

5.2 Structuring

\leqno

Equation numbers in displayed formulas will appear on the left instead of the normal right side.

`\fleqn`

Displayed formulas will be set flush left instead of centered.

5.3 Writing Exams

5.3.1 Questions

```
\begin{questions}
  ⟨text⟩
\end{questions}
```

To create questions, use this questions environment.

`\question`

Once you have created the question environment, you can begin questions using the `\question` command.

`\vspace1{\stretch{1}}`

Replace `\vspace1` with `\vspace`

This command allows you to evenly space questions along the page.

5.3.2 Choices

```
\begin{choices}
  ⟨text⟩
\end{choices}
```

To create choices for a questions, use this environment.

`\choice`

This command allows you to create choices inside of the choices environment.

5.3.3 Displaying Solutions

The exam document class defines several environments for solutions, the contents of which will be printed only if you use the document class option answers as in the:

```
\documentclass[answers]{exam}
```

which you can find by going to the examMC .tex file within the folder originally containing this document and adding [answers] at the top of the preamble at the document class or give the command `\printanswers`.

Each of the environments for multiple choice questions designate one or more of the choices as correct choices, and to have the correct choices printed with emphasis *only*when solutions are being printed.

The command to define a correct choice is `\CorrectChoice`, which is used in place of the command `\choice`. (To avoid confusion, `\correctchoice` is defined to be a synonym for `\CorrectChoice`) When solutions are not being printed, `\CorrectChoice` is equivalent to `\choice`. When solutions are being printed, though, any choices that were created with `\CorrectChoice` (rather than with `\choice`) will be printed in bold.

`\correctchoice`

5.3.4 Source Code - Questions

```
\begin{questions}
\question \quad
{If $\textit{f}(x) = \frac{1}{4}x^4+x^3$ What is $\frac{d}{dx}$?}
\vspace{2mm}
\begin{choices}
\choice 5x
\correctchoice $20x^3$+$3x^2$
\choice $x^3$+$3x^2$
\choice 2x
\choice $20x^2$
\end{choices}
\vspace{\stretch{1}}
```

5.3.5 Source Code - Questions with Image on the side

```
\question \quad
\begin{minipage}[t]{0.65\linewidth}
{$\int{(3x + 1)^5}$\textit{dx}} =
\vspace{2mm}
\begin{choices}
\correctchoice \large{$\frac{(3x + 1)^6}{18} + C $}
\choice \large{$\frac{(3x + 1)^6}{6}$ + C}
\choice \large{$\frac{(\frac{3x}{2} + 1)^6}{2}$ + C}
\choice \large{$\frac{(3x + 1)^6}{2}$ + C}
\choice \large{$(\frac{3x}{2} + x)^5$ + C}
\end{choices}
\end{minipage}\hfill%
\begin{adjustbox}{minipage={0.30\linewidth},valign=t}
\includegraphics[width=\linewidth]{example-image-a}
\end{adjustbox}
\vspace{\stretch{1}}
```

5.4 Math Commands

`\boxed`

Inserts a box around an equation.

6

SECTION

List of Already Defined Environments and Macros

The following subsections are lists and examples of pre-defined macros or commands. Creating a macro in latex is effectively similar to creating a shortcut. Macros allow for a cleaner, more efficient process of writing the code for your document.
Macros are great for repetitive elements and texts that you carry across several documents.

6.1 Main Box Environments

6.1.1 Theorems

```
\begin{theo}
  ⟨text⟩
\end{theo}
```

This environment `\begin{Theo}` inserts a new yellow theorem box with a black frame into the document.

6.1.2 Boxes for Definitions

```
\begin{definition}
  ⟨text⟩
\end{definition}
```

This environment `\begin{definition}` inserts a regular definition into the document.

6.1.3 Boxes for Examples

\begin{example}{*title*}
  ⟨*text*⟩
\end{example}

This environment \begin{example} creates a regular example box.
After inserting the question for the specified example, make sure to use the command \tcbline or \tcblower. This command creates a dashed line within the example box or any pre-created box and allows for you to created a specified space for the students to fill in the solution.

\begin{longexample}{*title*}
  ⟨*text*⟩
\end{longexample}

Environment for creating examples inside lessons whose text is quite lengthy or the example requires a good amount of work or drawing.
If one wants to extend the box of the height further that the default value, go to the lesson.tex file inside of the lessons folder. Once inside of the lesson.tex file, go down to about line 136, inside the examstyle./style, and change the height from 9.5cm to your preferred value.

6.1.4 Boxes for Discussions

\begin{discussion}{*title*}
  ⟨*text*⟩
\end{discussion}

This environment inserts a box similar to the example box just instead labeled discussion.
Similar to the example box as well, after inserting the question or text, make sure to use the command \tcbline. This command will create a dashed line within the box and allows for you to created a specified space for the students to fill in the solution or drawing etc. preferred value.

6.1.5 Boxes for Visualizations

\begin{visualization}{*title*}
  ⟨*text*⟩
\end{visualization}

This environment inserts a box similar to the example and discussion boxes just instead for visualizations.

6.2 Extra Box Environment

```
\begin{DashedDefinition}
  ⟨text⟩
\end{DashedDefinition}
```

This command offers another option for a definition box just with a dashed frame.