A SHORT INTRODUCTION TO THE SDSU LaTeX THESIS MATERIALS

A Thesis

Presented to the

Faculty of

San Diego State University

In Partial Fulfillment

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Master of Arts

in

Mathematics

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by

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A Short Introduction to the

SDSU LaTeX Thesis Materials

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DEDICATION

Dedicated to me, as no one else is deserving.

Shaken, not stirred.

– James Bond

ABSTRACT OF THE THESIS

A Short Introduction to the
SDSU LaTeX Thesis Materials
by
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This document is intended to help students at San Diego State University to use LaTeX to produce a Master's Thesis with high-quality typesetting. Instructions are given for obtaining and using materials developed by the Department of Mathematics and Statistics that ensure that the thesis satisfies the requirements of the Graduate Division at San Diego State.

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ACKNOWLEDGEMENTS

Here goes the acknowledgment. This is your chance to pay homage to your professors.

CHAPTER 1

INTRODUCTION

This is the short example thesis produced by the Department of Mathematics and Statistics at San Diego State University as a guide to using the LaTeX template created by the Department. It complies with the SDSU Thesis Manual produced in 2004 [9].

If you don't find what you need in this document, a longer example using additional tools is also available.

1.1 PURPOSE

This is a document to help the student understand the basic tools that LaTeX provides for typesetting, layout and referencing. LaTeX is a remarkably powerful package, but it does take some effort to learn. The best plan is to start with something already written and learn from the example. The current document was produced for this purpose. This document illustrates how the student should format the chapters and sections of the thesis, prepare the bibliography, and include other appropriate items commonly found in a technical document. The title page, signature page, acknowledgments page, abstract, and everything else are all formatted according to specifications of the SDSU Thesis Manual of 2004, once you enter the text.

For a general reference it is recommended that the student obtain the user's guide and reference manual of Leslie Lamport [10]. The student should obtain copies of the files used to generate this document (available at [11]), then examine the ASCII files used to generate the document and the LaTeX output. This basic example uses the files sdsu-thesis.cls (which defines the layout and formatting), thesis.tex (which includes the text of the thesis, the abstract, the title page, the bibliography, etc.) and mapping.eps (a postscript file for a figure). A longer example using more of the power of LaTeX is also included in the distribution.

1.2 WHY LaTeX?

LaTeX allows you as a writer to ignore formating and focus on the material that you are presenting. LaTeX automatically uses the correct fonts, spacing and layout. It also keeps track of enumerated items (chapters, sections, theorems, definitions, bibliographical entries, footnotes, etc) and automatically adjusts when new items are added or deleted. Reference to these enumerated items is also handled by LaTeX.

Documents produced by LaTeX are professionally typeset. Perhaps the most obvious benefits from using LaTeX are the high quality of the mathematical typesetting and the (relative) ease with which it is produced. Almost all mathematical journals and books are now produced with LaTeX.

1.3 HISTORY

In the early 1990's Richard Frost put together a LaTeX style file for SDSU theses based on LaTeX 2.09. Joe Mahaffy wrote an example thesis to guide students in the use of LaTeX code. Since that time LaTeXhas been upgraded to LaTeX2e and the formatting requirements for SDSU have also changed. In 2004, Jiri Lebl and Mike O'Sullivan worked on a revision, upgrading to LaTeX2e, and, bringing the format into compliance with the latest SDSU Thesis Manual. This LaTeX2e class file was written by Jiri Lebl and has almost nothing in common with the old LaTeX style. It is a modification of the standard report class. The top of the sdsu-thesis.cls has some additional information on the version and history of this class file.

Please let us know if you find problems, particularly if you also find solutions to them! We welcome additional material.

CHAPTER 2

GETTING STARTED

The Department of Mathematics and Statistics has prepared a number of materials to help students with their introduction to LaTeX. Students can download an archive containing several files at [11]. Here we explain how to use the package and how to write and process a LaTeXfile.

2.1 THE SDSU LaTeX PACKAGE

The SDSU LaTeX package has two example theses. This is the short and basic one. More advanced use of tables, figures and mathematical equations is treated in a longer example. The use of BibTeX for doing bibliographies is also explained in that example. Several `README` files are included in the package. These explain how to get and use LaTeX on different platforms. Since material changes quickly, the web is probably the most valuable resource.

Your first step should be downloading the package from the Department's website and unpacking it in a directory dedicated to your thesis. We recommend creating a new directory, `mythesis` for example, to contain your work. Copy `sdsu-thesis.cls` into that directory. Then create a `mythesis.tex` file and copy what you want from the two example theses into that file. The directory for this example thesis contains the following files:

- `sdsu-thesis.cls`: Defines the layout and formatting.
- `thesis.tex`: Contains all the text for the thesis: the title page, and other front-matter, the abstract, the body of the thesis, the bibliography, and the appendix.
- `mapping.eps` An encapsulated postscript file to be included in the thesis.
- `Makefile` This can be used on a unixlinux platform to simplify the processing of LaTeX/ files.

For a general reference it is recommended that the student obtain the user's guide and reference manual of Leslie Lamport [10]. There are also a number of useful tutorials on the web: The Indian TeX Users Group has a nicely organized and presented web page [8]; The Mathematices Department at the University of Illinois has a tutorial developed under funding from a Research Experiences for Undergraduates grant from the National Sciences Foundation [7].

2.2 WRITING A LaTeX FILE

The best way to learn LaTeX is to take advantage of someone else's work, using it as a model for your document. This pseudo-thesis should give you a good working example from which to start. The key commands to create any document are the following:

```
\documentclass[options]{class}
\begin{document}
Insert any text you want in here.
\end{document}
```

where *class* is some class type. For SDSU Thesis you would normally use the `sdsu-thesis` class. When you're writing your thesis and want a draft printout you can also add options such as `savepaper` which will single space your document, and use larger margins. The standard for the final thesis is $1\,1/2$ space. If you want double spaced then uncomment the `doublespace` option.

You will see a host of other LaTeX code in the file `thesis.tex`. You need to edit the title, degree, and other things to comply with your personal situation. The body of your thesis comes immediately after the \begin{document} command.

2.3 PROCESSING A LaTeX FILE

README files for the different operating systems accompany this distribution. There are many "front-ends" for LaTeX, some are freely available on the web, others available for purchase. Here we explain how to use the command line to process LaTeX on a unix/linux system (also with Mac OS X).

To process a LaTeX document that you have named `filename.tex`, you simply type `latex filename`. For example, this document is generated by its driver file with `latex thesis`. If it is the first time or if you have made changes that affect the numbering of sections, equations, bibliographic references or other items, then you need to execute `latex filename` twice.

After you have performed the above procedure, you will have a file named `filename.dvi` (or `thesis.dvi` in our case) which is a device independent file. There are several means of viewing your output. If you are working in an Xwindow environment, then the simplest procedure is to type `xdvi filename.dvi`, which will open a window for viewing the LaTeX document. It will not include any postscript figures, but it is automatically updated each time you latex your document.

The second procedure for either viewing with ghostview or printing involves the conversion of the .dvi file to a postscript file. (You may want to examine `man dvips` for assistance.) The simplest way to convert the .dvi file to a postscript file is to type the following:

```
dvips -o filename.ps filename.dvi
```

This creates the postscript file, `filename.ps`. If you do not need the entire document, then you can type:

```
dvips -px -ly -o filename.ps filename.dvi
```

where `x` is the number of the first page and `y` is the number of the last page.

To get a hard copy you should use the standard printing commands of your system. If you are on your own Linux system at home, usually `lpr filename.ps` will print the file.

In case your computer system has a different paper size set up as default then "letter" you can force a letter paper size by adding `-t letter` as an option to `dvips`. This can happen if you are using a different language from American English.

A third option is to make a `pdf` file. Use the command `ps2pdf filename.ps`.

The makefile included in this distribution simplifies many of the sequences of commands that you might use. For example, just type `make` to create a postscript file or `make view` to create a postscript and view it using a postscript viewer. Also, `make clean` will remove all the files created by LaTeX processing.

2.4 Internal Referencing

In technical documents it is common to have references to various other portions of the document. For example to refer to a chapter by number we might say something like: Chapter 4 is the really important one. This is accomplished in LaTeX by typing

```
\chapter{THE MIDDLE}
\label{c:middle}
```

at the beginning of the chapter referred to, and then using `\ref{c:middle}` to refer to the chapter. The text `THE MIDDLE` gives the title of the chapter.

Similar referencing ideas work for sections, figures, tables, theorems, equations, etc. Bibliographical items are referenced in a slightly different manner. We discuss the bibliography and citations in Chapter 5.

2.5 Other Formatting Issues

LaTeX doesn't care how many spaces there are between words, it will adjust the space for each line. You type new paragraphs by just leaving an empty line between them. Don't leave an empty line unless you want to start a new paragraph.

Use {\em really} when you *really* want to emphasize something.

Occasionally the formatting is not as you would like, particularly near figures. The command \hspace{1in} adds horizontal space and \vspace{1in} adds vertical space. You may also use pt (points) or cm as measurements. The starred form \hspace*{12pt} of the command is more persuasive than the unstarred form. For breaking a line, \newline or \linebreak and for breaking a page \clearpage, \pagebreak, \newpage are used, with subtle differences between these commands (see a good reference).

CHAPTER 3

FUN WITH LaTeX

As described earlier, LaTeX takes care of referencing chapters, sections, equations, theorems, figures, bibliographical citations, etc. It is also extremely useful for typesetting mathematics, making tables and inserting figures into the document. Here are a few small examples.

3.1 SOME MATH

You can have fun formulas, such as $x = 7y^x$. If you want the equations displayed on separate lines you use `\[` and `\]` to enclose the mathematics, or you can use

```
\begin{equation*}
 math stuff
\end{equation*}
```

as in (see `thesis.tex`)

$$\int_{\partial\Omega} \omega = \int_{\Omega} d\omega.$$

There are several other ways to display equations. The code for this one (see `thesis.tex`) aligns all the equal signs.

$$(x+2)^3 = (x+2)(x+2)^2 \tag{3.1}$$
$$= (x+2)(x^2+4x+4) \tag{3.2}$$

and when you multiply the two terms,

$$= x^3 + 6x^2 + 12 * x + 8 \tag{3.3}$$

Notice that this last set of equations is numbered, but the previous one is not. The * in the LaTeX code of the first example eliminates the numbering.

3.2 A FIGURE

Inclusion of Figure 3.1 is accomplished by the following text.

```
\begin{figure}[htb]
\centering
```

```
\begin{minipage}{5.0in}
\epsfig{file=mapping.eps,width=5.0in}
\caption{Mapping $f(x)$ from the complex plane to itself. \label{fig:graph}}
\end{minipage}
\end{figure}
```

The `\minipage` environment is not necessary to produce a figure, but we use it here to ensure that the caption is lined up with the left hand side of the figure. The measurement `5.0in` is something you will have to adjust for each figure.

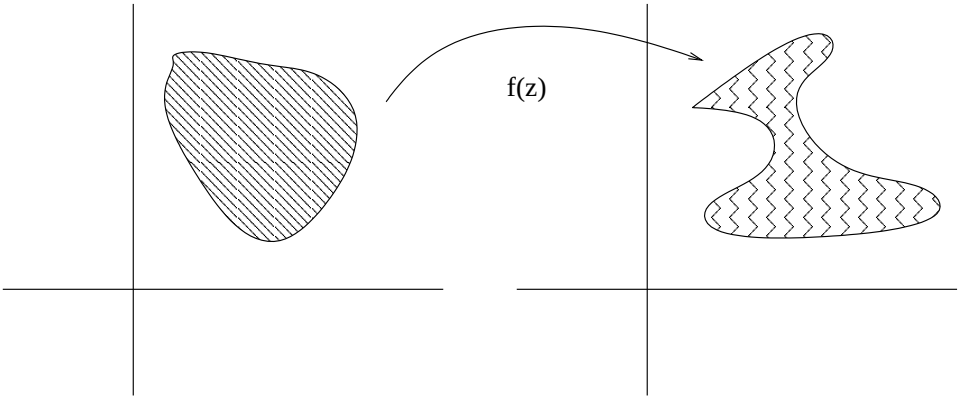

Figure 3.1. Mapping $f(x)$ from the complex plane to itself.

We can refer to it, as you may see in `thesis.tex`, and LaTeX takes care of the numbering. Placement of figures (and tables) is also done automatically, with some input from you. The `htb` in the LaTeX code prioritizes placement of the figure: first, "here," second, "top," finally "bottom." You may have to fiddle with these items to get what you want. See a LaTeX manual for more information.

3.3 A TABLE

We may want to include a table too. See Table 3.1. For more examples on tables and figures, and how all this centering works see the long-example directory.

Table 3.1. A Small Table with a Very Long Title

Trial	a	b	c	ω
1	5	10	15	π
2	10	20	15	2π

CHAPTER 4

THE MIDDLE

Here we put the middle things, that is, things that are in the middle and not in the beginning or in the end. Here we also test all the section, subsection, and other headings.

4.1 A Section

Some section text.

4.1.1 A Subsection With a Very Long Title to See How That Will Look When Printed

Some subsection text.

4.1.1.1 A Subsubsection

Some subsubsection text.

4.1.1.1.1 A Subsubsubsection

Some subsubsubsection text. If you are using this, you are probably over-organizing things.

4.1.1.1.1.1 A Paragraph. Some paragraph text. A bit overdone at this point, don't you think?

CHAPTER 5

CREATING A BIBLIOGRAPHY

There are two ways to create a bibliography. In this short example thesis you simply enter the bibliographic data as you would like it to appear. One example is

```
\bibitem{Abr}
T.~Abraham.
\newblock Mathematical study of $\gamma$-rings in a Hilbert space.
\newblock {\em J. Math. Anal. Appl.}, 19:125--128, 1984.
```

The term `\bibitem` before each bibliographic entry identifies the beginning of the entry. The text `Abr` is the "tag" for this entry. You use it in the text to cite this article by writing `\cite{Abr}`. The text `\newblock` is not necessary, but helps LaTeX with formatting.

You are responsible for putting the bibliographical entries in alphabetical order, and entering the data with the correct style. LaTeX takes care of the enumeration and the referencing. In the bibliography we have included references for journal articles [1], books and booklets [2, 15], chapters or articles in books, collections, and proceedings [5, 4, 14]. Other sources may be proceedings [3], technical reports [12], theses [6], or unpublished material [13]. A number of online references are also given [7, 8]. This should provide a fairly comprehensive list for any material that the student may encounter. For additional assistance, see the graduate adviser in your area of concentration.

When you want to include a reference to a particular page, theorem chapter or whatever, you can use an optional argument to the cite command. For example, [2, Prop. 1.14]

In the long example we show an alternative method for creating a bibliography, using BibTeX and a bibliographic database. BibTeX allows you to enter the bibliographic data, or copy it from some source, and not worry about the formatting style. Another advantage of BibTeX is that you may use other switch between different bibliographical formats easily.

CHAPTER 6

CONCLUSION

Conclusion of the thesis.

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APPENDIX

RANDOM THINGS

RANDOM THINGS

Here we include random appendix kind of things.

ABSTRACT OF THE THESIS

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