A Student's Guide to Thesis Formatting

with UICTHESI

by

The Computer Center
updated by Thomas McKibben
of the
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THESIS

Submitted as partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Thesis Formatting
in the Graduate College of the
University of Illinois at Chicago, 2023

Chicago, Illinois

Defense Committee:
Person A, Chair and Advisor
Person B
Person C, University D

The dedication is optional, but if it is desired, the proper format for it is created with the command `\dedication` followed by the text of the dedication. It untitled and does not appear in the Table of Contents.

ACKNOWLEDGMENT

The acknowledgment is optional, but if it is desired, the proper format for it is created with the command `\acknowledgment` followed by the text of the acknowledgment. The title **ACKNOWLEDGMENT** will be centered at the top of the page. Subsequent pages will have the heading **ACKNOWLEDGMENT (continued)**. If more than a single person is being acknowledged, the command should be given as `\acknowledgments`. The section title and continued page headings will then be the plural **ACKNOWLEDGMENTS** and **ACKNOWLEDGMENTS (continued)**. It will not appear in the Table of Contents. To create the indented signature, include the line `\initials{XXX}`, where `XXX` are the initials of the author.

SSS

PREFACE

The preface is optional, but if it is desired, the proper format for it is created with the command `\preface` followed by the text of the preface. The title **PREFACE** will be centered at the top of the page. Subsequent pages will have the heading **PREFACE (continued)**. It will not appear in the Table of Contents.

This document is intended to introduce the student and prospective dissertation writer to the use of the UICTHESIS system for preparing a dissertation meeting the format requirements of the Graduate College of the University of Illinois at Chicago. It is based on the LaTeX document preparation system, which in turn is based on the TeX typesetting system. TeX is a powerful text formatter which is especially suited for technical works involving a lot of mathematics. It was developed by a mathematics professor at Stanford for the publication of his own books. LaTeX is a *macro* facility built on top of TeX that, while providing the typesetting power of TeX, allows a user to describe the organization of his work in logical rather than physical terms. To create a chapter heading, for instance, the user of TeX must provide the appropriate spacing, centering, and font size information. A writer using LaTeX needs only to provide the text of the chapter heading. The LaTeX system already knows the physical commands needed to format the chapter heading correctly. This is made possible by the creation of a *style file* which defines for the user just those physical instructions required for each of the logical parts of the paper. Those who have used Waterloo SCRIPT at UIC may be familiar with a similar facility within that program called GML.

PREFACE (Continued)

UICTHESI is a non-standard document style file, locally developed to enable students at UIC to prepare dissertations that conform to the requirements of the Graduate College. For several years, we have had a thesis formatting system at UIC based on the GML facility of Waterloo SCRIPT. That system `UICTHESI SCRIPT` remains and in fact it has been recently upgraded. However, some users may find that it is unsatisfactory for their use, especially those in technical fields, where a large part of their work consists of complex mathematical expressions. This may also be the case for personal computer based word processors such as Word, and WordPerfect which do not handle large documents containing graphics with very much grace. UICTHESI is a style file intended to meet the needs of those users. The UICTHESI system is, however, suitable for preparing theses in any field whether they require complex mathematical typesetting capabilities or not.

This is not an exhaustive description of TEX or LATEX. It provides only the *essential* information that you will need in order to use UICTHESI. Only very basic features of LATEX are covered, and a vast amount of detail has been omitted. In particular, many features of the new LATEX 2_ϵ standard are omitted. In a document of this size it is not possible to include everything that you might need to know. If you intend to make extensive use UICTHESI you should refer to a more complete reference. Attempting to produce complex documents using only the information found below will require much more work than it should, and will probably produce a less than satisfactory result.

This document does, however, cover the features specific to UICTHESI. This document is itself a creation of the UICTHESI system. The source of the document, `UICTMAN TEX`, is an

excellent example of how to use the system. This has been updated for use with LaTeX2$_\epsilon$ which is the current standard.

The primary reference for LaTeX is The LaTeX User's Guide and Reference Manual(1). It contains just about all the information that you will ever need to know about LaTeX, and you will need access to a copy if you are to use LaTeX or UICTHESIS successfully. The book LaTeX for Scientists and Engineers(2) is also a valuable general reference. Web surfers will find CTAN, the Comprehensive TeX Archive Network a particularly rich source of information and tools. Use Netscape, the IBM Web Explorer for OS/2 or other web browser to link to http://jasper.ora.com/ctan.html.

Important site-specific references you should read are available through `INFORM` on UICVM. The most important of these documents are Using TeX at UIC(3), Using LaTeX at UIC(4), Mainframe TeX Version 3.1 and Related Software(5), and TeX, LaTeX, and $\mathcal{AMS}$-TeX Output on the Xerox 8790s at UIC (TeXRoX)(6). If you are preparing your thesis on a personal computer, then be sure to read the documentation that came with your TeX software.

The authoritative reference for thesis formatting at UIC is published by the Graduate College(7). UICTHESIS is an attempt to assist the student to conform to those requirements, but the Graduate College publication is the final authority in such matters where this document and Graduate College requirements differ.

This document incorporates information from a number of sources, including Essential LaTeX(8) by Jon Warbrick of Plymoth Polytechnic, UK.

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LIST OF ABBREVIATIONS

AMS	American Mathematical Society
CTAN	Comprehensive TEX Archive Network
TUG	TEX Users Group
UIC	University of Illinois at Chicago
UICTHESI	Thesis formatting system for use at UIC.

SUMMARY

A summary is required. The proper format for it is created with the command `\summary` followed by the text of the summary. The title **SUMMARY** will be centered at the top of the page. Subsequent pages will have the heading **SUMMARY (continued)**. It will not appear in the Table of Contents.

CHAPTER 1

LaTeX

Before there was UICTHESIS, there was LaTeX. The LaTeX system is still present on UICVM; UICTHESIS depends on it. Before you can use it, you must give the command GETDISK TEX. This will allow the user access to the newest version (3.1) of TeX and LaTeX, which includes the $\mathcal{AMS}$ extensions.

A document to be prepared with LaTeX should be created with a text editor, such as `XEDIT` on UICVM, `emacs` on TIGGER or ICARUS or your favorite editor if you are using EM TeX under DOS or OS/2 on a PC or Oz TeX on a Mac. If you choose to use a word processor such as DeScribe, Word, or WordPerfect, be sure to save your files in ASCII format which is plain text. Any combination of 8 or less characters acceptable to UICVM as a file name may be used, but the file type must be `TEX`. Unix, OS/2, Windows NT, and Windows 95 all allow file names with more than 8 characters, however your implementation of LaTeX may not so it is best to stick to 8 or less until you are sure. To create the document once the `TEX` file has been created, enter the command `LATEX <fn>`, where `<fn>` is the file name. The LaTeX processor will create several files, including a file with the same file name but with the extension `DVI`. The `DVI` file may be printed with the `PRINTTEX` printer driver, i.e. `PRINTTEX <fn>`.

The rest of this chapter is a brief discussion of standard LaTeX. For those readers familiar with the workings of LaTeX, and who wish to get right to material about UICTHESIS, you may skip to the next chapter.

1.1 Standard Document Styles

LaTeX provides a number of standard *document styles* that determine exactly how a document will be formatted. Rather than occupying the student with mechanical concerns about how your thesis should be laid out, LaTeX instructions allow students to describe its *logical structure*. For example, you can think of a quotation embedded within your text as an element of this logical structure: you would normally expect a quotation to be displayed in a recognizable style to set it off from the rest of the text. A human typesetter would recognize the quotation and handle it accordingly, but since LaTeX is only a computer program, it requires your help. The LaTeX system provides a command that allows the writer to identify quotations and allow LaTeX to typeset them correctly.

There are a number of good reasons for concentrating on the logical structure rather than on the appearance of a document. It prevents you from making elementary typographical errors in the mistaken idea that they improve the aesthetics of a document—you should remember that the primary function of document design is to make documents easier to read, not prettier. It is more flexible, since you only need to alter the definition of the quotation style to change the appearance of all the quotations in a document. Most important of all, logical design encourages better writing. A visual system makes it easier to create visual effects rather than a coherent structure; logical design encourages you to concentrate on your writing and makes it harder to use formatting as a substitute for good writing.

There are four standard document styles available in LaTeX:

article intended for short documents and articles for publication. Articles do not have chapters, and when `\maketitle` is used to generate a title (see Section 2.5.1) it appears at the top of the first page rather than on a page of its own.

report intended for longer technical documents. It is similar to `article`, except that it contains chapters and the title appears on a page of its own.

book intended as a basis for book publication. Page layout is adjusted assuming that the output will eventually be used to print on both sides of the paper.

letter intended for producing personal letters. This style will allow you to produce all the elements of a well laid out letter: addresses, date, signature, etc.

These standard styles can be modified by a number of *style options*. They appear in square brackets after the `\documentstyle` command. Only one style can be used at a time, but you can have more than one style option, in which case their names should be separated by commas. The standard style options are:

11pt prints the document using eleven-point type for the running text rather that the ten-point type normally used. Eleven-point type is about ten percent larger than ten-point.

12pt prints the document using twelve-point type for the running text rather than the ten-point type normally used. Twelve-point type is about twenty percent larger than ten-point.

twoside causes documents in the article or report styles to be formatted for printing on both sides of the paper. This is the default for the book style.

titlepage causes the `\maketitle` command to generate a title on a separate page for documents in the `article` style. A separate page is always used in both the `report` and `book` styles[1].

1.2 $\mathcal{AMS}$-LaTeX Document Styles

The current version of LaTeX at UIC supports $\mathcal{AMS}$-LaTeX. Included with $\mathcal{AMS}$-LaTeX are several new document styles: `amsart` and `amsbook`. These are similar to the standard LaTeX styles `article` and `book`, except that they have been specially modified to meet the article and book requirements of AMS. For further information on these styles, see the document $\mathcal{AMS}$-LaTeX Version 1.0 User's Guide(9).

[1]Because file names on UICVM are limited to 8 characters, this option is named `titlepag`.

CHAPTER 2

GETTING STARTED WITH UICTHESI

2.1 Overall Structure

Some LaTeX commands must appear in every document. The actual text of the document always starts with `\begin{document}` and ends with `\end{document}`. Everything that comes before the `\begin{document}` command is called the *preamble*. The preamble can only contain LaTeX commands to describe the document's style. Anything that comes after the `\end{document}` command is ignored.

One command that must appear in the preamble is the `\documentclass` command. This command specifies the overall style for the document. The standard styles are described earlier in this document. The most important style for the student preparing a thesis at UIC is UICTHESI. This file, and the document that you wish to prepare with UICTHESI, are initiated by using the command `\documentclass{uicthesi}` Normally, no style options are required. What would be style options for the standard document styles, such as options for double spacing or for a titlepage, are already built into UICTHESI. When using UICTHESI, the default type size is 11 point. Unlike the standard LaTeX document styles, there is no option to change the default typesize to either 10 points or 12 points. 11 point size is acceptable by the graduate college. If the special symbols or fonts included in the $\mathcal{AMS}$ font

collection are required, include the style option `amssymb`, in the document style declaration, i.e.

```
\documentclass[amssymb]{uicthesi}
```

2.2 Running Text

Most documents consist almost entirely of running text—words formed into sentences, which are in turn formed into paragraphs. Describing running text poses no problems, you just type it in naturally. In the output that it produces, LaTeX and UICTHESIS will fill lines and adjust the spacing between words to give tidy left and right margins. The spacing and distribution of the words in your input file will have no effect at all on the eventual output. Any number of spaces in your input file are treated as a single space by LaTeX, it also regards the end of each line as a space between words. A new paragraph is indicated by a blank line in your input file, so don't leave any blank lines unless you really wish to start a paragraph.

LaTeX reserves a number of the less common keyboard characters for its own use. The ten characters

```
# $ % & ~ _ ^ \ { }
```

should not appear as part of your text, because if they do LaTeX will get confused.

2.3 LaTeX and UICTHESIS Commands

There are a number of words in any LaTeX document that start '\'. These are LaTeX *commands* and they describe the structure of your document. There are a number of things that you should realize about these commands:

1. All LaTeX commands consist of a '\' followed by one or more characters.

2. LaTeX commands should be typed using the correct mixture of upper- and lower-case letters. `\BEGIN` is *not* the same as `\begin`.

3. Some commands are placed within your text. These are used to switch things, like different typestyles, on and off. The `\em` command is used like this to emphasize text, normally by changing to an *italic* typestyle. The command and the text are always enclosed between '`{`' and '`}`'—the '`{`' turns the effect on and and the '`}`' turns it off. So when I write `{\em emphasized text}`, I get *emphasized text*.

4. There are other commands that look like

   ```
   \command{text}
   ```

   In this case the text is called the "argument" of the command. The `\section` command is like this[1]. Sometimes you have to use curly brackets '`{}`' to enclose the argument, sometimes square brackets '`[]`', and sometimes both at once[2]. There is method behind this apparent madness, but for the time being you should be sure to copy the commands exactly as given.

5. When a command's name is made up entirely of letters, you must make sure that the end of the command is marked by something that isn't a letter. This is usually either

---

[1] The command to create footnotes is like this also. Just give the command `\footnote{...text...}` where `...text...` is the text of the footnote.

[2] Note that the footnotes start with 1 for each page and that the text of the footnote is single spaced at the bottom of the same page.

the opening bracket around the command's argument, or it's a space. When it's a space, that space is always ignored by LaTeX. We will see later that this can sometimes be a problem.

2.4 Other Things to Look At

LaTeX can print both opening and closing quote characters, and can manage either of these either single or double. To do this, it uses the two quote characters from your keyboard: ` and '. You will probably think of ' as the ordinary single quote character which probably looks like ´ or ' on your keyboard, and ` as a "funny" character that probably appears as `. You type these characters once for single quote, and twice for double quotes. The double quote character " itself is almost never used.

LaTeX can produce three different kinds of dashes. A long dash, for use as a punctuation symbol, as is typed as three dash characters in a row, like this '---'. A shorter dash, used between numbers as in '10–20', is typed as two dash characters in a row, while a single dash character is used as a hyphen.

From time to time you will need to include one or more of the LaTeX special symbols in your text. Seven of them can be printed by making them into commands. To do this precede them with a backslash. The remaining three symbols can be produced by more advanced commands, as can symbols that do not appear on your keyboard such as †, ‡, §, £, ©, ♯ and ♣.

It is sometimes useful to include comments in a LaTeX file, to remind you of what you have done or why you did it. Everything to the right of a % sign is ignored by LaTeX, and so it can be used to introduce a comment.

The use of underlining is rarely seen in fine text, but the UIC Graduate College thesis formatting requirements are derived from manuscript form, rather than the form for a finished document. Underlining is commonly found in such manuscripts, especially in place of italics for emphasis. UICTHESIS automatically underlines section titles and those items in the bibliography which, in finished text form, would appear in italics. To underline an arbitrary piece of text, use the `\underl` command as follows:

```
{\underl This is text to be underlined & }
```

The ampersand marks the place where the underlining is to end. Note that the underlining will break for the end of lines and wrap around. The brackets at surrounding the command and the space before and after the terminating `&` are required.

2.5 Front Matter

2.5.1 Title Page

A thesis at UIC must have a title page. To prepare a title page for a UICTHESIS thesis, you include commands in the preamble to identify the title

```
\title{Advances in Thesis Formatting}
```

the author

```
\author{Samuel S. Student}
```

the author's prior degrees

```
\pdegrees{B.S.University of Hither}
```

```
\title{Advances in Thesis Formatting}

\author{Samuel S. Student}

\pdegrees{B.S.University of Hither,1983\\

M.S.University of Thither,1985\\

M.A.University of Yon,1986}

\degree{Doctor of Philosophy in Pool}

...

\maketitle
```

ADVANCES IN THESIS FORMATTING

BY

SAMUEL S. STUDENT
B.S.University of Hither, 1983
M.S.University of Thither, 1985
M.A.University of Yon, 1986

THESIS

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Pool
in the Graduate College of the
University of Illinois at Chicago, 1996

Chicago, Illinois

Figure 1. Creating a titlepage

and the degree for which the thesis is written

```
\degree{Doctor of Philosophy in Pool}
```

UICTHESI automatically produces the title and author's name in all upper case letters even if the writer enters them in mixed upper and lower case. Immediately after the `\begin{document}`, include the command `\maketitle`. Figure 1 is an example of how to produce a title page.

If you are not using UICTHESI but are using one of the standard LaTeX styles, the `\degree` and `\pdegrees` fields are omitted but a `\date` field is included. In the `report`, `book` and

UICTHESIS style, a full page title page is created, but in the `article` style it normally appears at the top of the first page, the style option `titlepage` will alter this (see Section 1).

2.5.2 Preliminary Sections

2.5.2.1 Creating a Copyright Page

The optional copyright page is produced by including the line `\copyrightpage` just after `\maketitle`.

2.5.2.2 Creating a Dedication

The dedication is optional, but if it is desired, the proper format for it is created with the command `\dedication` followed by the text of the dedication. It untitled and does not appear in the Table of Contents.

2.5.2.3 Creating an Acknowledgment

The acknowledgment is optional, but if it is desired, the proper format for it is created with the command `\acknowledgment` followed by the text of the acknowledgment. The title **ACKNOWLEDGMENT** will be centered at the top of the page. Subsequent pages will have the heading **ACKNOWLEDGMENT (continued)**. If more than a single person is being acknowledged, the command should be given as `\acknowledgments`. The section title and continued page headings will then be the plural **ACKNOWLEDGMENTS** and **ACKNOWLEDGMENTS (continued)**. It will not appear in the Table of Contents. To create the indented signature, include the line `\initials{XXX}`, where `XXX` are the initials of the author.

2.5.2.4 Creating a Preface

The preface is optional, but if it is desired, the proper format for it is created with the command `\preface` followed by the text of the preface. The title **PREFACE** will be centered across the page. Subsequent pages will have the title **PREFACE (continued)**. It will not appear in the table of contents.

2.5.2.5 Creating the Table of Contents and Lists of Figures and Tables

Including the command `\tableofcontents` in your document will cause a contents list to be included, containing information collected from the various sectioning commands as described in 2.6. You will notice that each time your document is run through UICTHESI the table of contents is always made up of the headings from the previous version of the document. This is because UICTHESI collects information for the table as it processes the document, and then includes it the next time it is run. This can sometimes mean that the document has to be processed through UICTHESI twice to get a correct table of contents. At the present time, only the numbered style of table of contents is available. The mixed letter and numbered style of section identification is not available. The title **TABLE OF CONTENTS** will be centered at the top of the page. Any pages after the first page will have a **TABLE OF CONTENTS (Continued)** heading.

The commands `\listoffigures` and `\listoftables` perform a similar function with the figures and tables defined in your text.

2.5.2.6 Creating a List of Abbreviations

The List of Abbreviations is generated by the command `\listofabbreviations` followed by the text of the list. Formatting of the list itself is left up to the student, although an example of how it can be done is found in the source file for this document. The title **LIST OF ABBREVIATIONS** will be centered at the top of the page. Any pages after the first page will have a **LIST OF ABBREVIATIONS (Continued)** heading. It will not appear in the Table of Contents.

2.5.2.7 Creating a Summary

A summary is required. The proper format for it is created with the command `\summary` followed by the text of the summary. The title **SUMMARY** will be centered at the top of the page. Subsequent pages will have the heading **SUMMARY (continued)**. It will not appear in the Table of Contents.

2.6 Sectioning Commands in the Body of the Thesis

Technical documents, like this one, are often divided into sections. Each section has a heading containing a title and a number for easy reference. LaTeX and UICTHESIS have a series of commands that will allow you to identify different kinds of sections. Once you have done this UICTHESIS takes on the responsibility of laying out the title and of providing the numbers.

The commands that you can use are shown in Figure 2. The naming of these last two kinds of sections are unfortunate, since they do not really have anything to do with 'paragraphs' in the normal sense of the word; they are just lower levels of section. Paragraphs, in the normal

```
\chapter

\section

\subsection

\subsubsection

\paragraph

\subparagraph
```

Figure 2. Sectioning commands

sense, are created by leaving a blank line in the text. The commands should be used in the order given, since sections are numbered within chapters, subsections within sections, etc.

In standard document styles, a seventh sectioning command, `\part`, is also available. Its use is always optional, and it is used to divide a large document into series of parts. It does not alter the numbering used for any of the other commands. `\part` is not available in UICTHESI.

2.7 Sectioning Commands in the Appendix

2.7.1 Starting the Appendices

When the thesis has reached that point where the main body of the text has ended and the appendix sections are to begin, the command `\appendix` should be used. All `\chapter` divisions after this point will be produce sectioning formats, headings and Table of Contents entries for appendices rather than for regular chapters.

2.7.2 Multiple Appendices

If the thesis contains more than one appendix, the command `\appendices` will create a page which contains only the word **APPENDICES** and the page number. This command should immediately precede the `\appendix` command described above.

2.8 Back Matter

2.8.1 Creating a Cited Literature Section

The Cited Literature section is created automatically by the `\bibliography{bblfile}` command. The `bblfile` in that command identifies the name of the external bibliography file created by BibTeX, described below.

2.8.2 Using BibTeX

BibTeX is a program for compiling a reference list for a document from a bibliographic database. It is run by entering

```
BIBTEX MYFILE
```

where `MYFILE TEX` is the name of your LaTeX input file. This reads the file `MYFILE AUX`, which was generated when you ran LaTeX on `MYFILE TEX`, and produces the file `MYFILE BBL`. The BibTeX program requires a separate source file, call a `BIB` file, containing the information that will appear in the Cited Literature section.

Instead of the `\bibliographystyle` command used with standard LaTeX styles, the particular bibliography style is selected by the command `\bibform`*n*, where *n* is either `a`, `b` or `c`. These commands correspond to the three bibliography styles described in the Graduate School

thesis manual(7). `\bibforma` creates text citations containing the author's name and the year of publication and creates an unnumbered, alphabetized Cited Literature section. `\bibformb` creates numbered text citations and creates a numbered Cited Literature section ordered by the order of their first appearance in the text. `\bibformc` creates numbered text citations like `\bibformb`, but the Cited Literature section is numbered and ordered alphabetically.

There is a simple BibTeX User's Guide available through INFORM (enter `INFORM BIBTEX` in CMS)

In the Cited Literature section near the end of this manual, there are sample entries for an article(10), a book(11), an article in a collection(12), and a thesis(13).

2.8.3 Creating a Vita

The vita is generated by the command `\vita` followed by the text of the vita. It is up to the user to provide the formatting commands within the vita. It will appear in the table of contents.

CHAPTER 3

ENVIRONMENTS

We mentioned earlier the idea of identifying a quotation to LaTeX or UICTHESIS so that it could arrange to typeset it correctly. To do this you enclose the quotation between the commands `\begin{quotation}` and `\end{quotation}`. This is an example of a LaTeX construction called an *environment*. A number of special effects are obtained by putting text into particular environments.

3.1 Quotations

There are two environments for quotations: `quote` and `quotation`. `quote` is used either for a short quotation or for a sequence of short quotations separated by blank lines. An illustration of how to create a quote environment is shown in Figure 3.

```
US presidents ... pithy remarks:

\begin{quote}

The buck stops here.


I am not a crook.

\end{quote}
```

US presidents have been known for their pithy remarks:

> The buck stops here.
>
> I am not a crook.

Figure 3. Creating a quote

```
Here is some advice to remember:

\begin{quotation}

Environments for making

...other things as well.


Many problems

...environments.

\end{quotation}
```

Here is some advice to remember:

> Environments for making quotations can be used for other things as well.
>
> Many problems can be solved by novel applications of existing environments.

Figure 4. Creating a quotation

Use the `quotation` environment for quotations that consist of more than one paragraph. Paragraphs in the input are separated by blank lines as usual. An illustration of how to create a quotation environment is shown in Figure 4.

3.2 Centering and Flushing

Text can be centered on the page by putting it within the `center` environment. It will appear flush against the left or right margins if it is placed within the `flushleft` or `flushright` environments.

Text within these environments will be formatted in the normal way, in particular the ends of the lines that you type are just regarded as spaces. To indicate a "newline" you need to type the \\ command. Figure 5 is an illustration of how to center text.

```
\begin{center}
one
two
three \\
four \\
five
\end{center}
```

one two three

four

five

Figure 5. Centering text

3.3 Lists

There are three environments for constructing lists. In each one each new item is begun with an `\item` command. In the `itemize` environment the start of each item is given a marker, in the `enumerate` environment each item is marked by a number. These environments can be nested within each other in which case the amount of indentation used is adjusted accordingly: An illustration of how to create a an enumerated list within an itemized list is shown in Figure 6.

The third list making environment is `description`. In a description you specify the item labels inside square brackets after the `\item` command. For an illustration of how to create a description list, see Figure 7.

```
\begin{itemize}
\item Itemized lists are handy.
\item However, don't forget
  \begin{enumerate}
  \item The 'item' command.
  \item The 'end' command.
  \end{enumerate}
\end{itemize}
```

- Itemized lists are handy.
- However, don't forget
  1. The 'item' command.
  2. The 'end' command.

Figure 6. Creating an enumerated list within an itemized list

```
Three animals that you should
know about are:
\begin{description}
  \item[gnat] A small animal...
  \item[gnu] A large animal...
  \item[armadillo] A ...
\end{description}
```

Three animals that you should know about are:

gnat A small animal that causes no end of trouble.

gnu A large animal that causes no end of trouble.

armadillo A medium-sized animal.

Figure 7. Creating a description list

3.4 Figures

Many dissertations will require illustrative materials in the form of figures. The `figure` environment is used to create a figure. You may create the content of the figure within UICTHESIS itself or leave empty space so that illustrative material from other sources may be copied in the blank space. An example of a figure environment is shown in Figure 8. In that example, you will notice a command `\label{example}` following the caption. This command allows a writer to refer to the figure by name instead of by number in the text of the thesis at a moment when the writer may not know what the number will be. In this example, the writer may refer to the figure as `\ref{example}` and it will appear in the text as "Figure 1", or whatever number the figure eventually becomes. The figure environment also generates information that will automatically produce a List of Figures. To specify where the List of Figures is to appear, use the command `\listoffigures`.

3.5 Tables

Many dissertations will require the display of tabular information. The `table` environment is used to create a table. You may, like the figure, create the content of the figure within UICTHESIS itself, or leave empty space so that the tabular content from other sources may be copied in the blank space. An example of a table environment is shown in Figure 9. Like figures, a table may take a `\label` command for symbolic reference. It works the same way, except that instead of "Figure 1", the `\ref{example}` will appear as "Table I". As with the figure environment, the table environment also generates information that will automatically

```
\begin{figure}
\vspace{3em}
\begin{center}
Place figure material here.
\end{center}
\vspace{3em}
\caption{This is an example.}
\label{example}
\end{figure}
```

Place figure material here.

Figure 1. This is an example.

Figure 8. How to create a figure.

produce a List of Tables. To specify where the List of Tables is to appear, use the command `\listoftables`.

3.6 Tabular Alignment with the Tabbing Environment

One of the hardest parts of typesetting is the creation of aligned material. The `table` environment described above does nothing to provide such alignments; it only sets off a section of material that will be labeled as a table and entered into the list of tables. The alignment of the material itself must be accomplished by other means. This section and the next will present two approaches, two environments that may be used within a `table` environment to align information.

Because LaTeX will almost always convert a sequence of spaces into a single space, it can be rather difficult to lay out tables. See what happens in the example in Figure 10.

```
\begin{table}
\caption{Example Table}
\label{example}
\tablerule
\vspace{3em}
\begin{center}
Place tabular material here.
\end{center}
\vspace{3em}
\tablerule
\end{table}
```

TABLE I

EXAMPLE TABLE

Place tabular material here.

Figure 9. How to create a table.

```
\begin{flushleft}
Income  Expenditure Result   \\
20s 0d  19s 11d     happiness \\
20s 0d  20s 1d      misery  \\
\end{flushleft}
```

Income Expenditure Result

20s 0d 19s 11d happiness

20s 0d 20s 1d misery

Figure 10. Tabular alignment: the wrong way

```
\begin{tabbing}
Income \=Expenditure \=    \kill
Income \>Expenditure \>Result \\
20s 0d \>19s 11d \>Happiness   \\
20s 0d \>20s 1d  \>Misery    \\
\end{tabbing}
```

Income Expenditure Result
20s 0d 19s 11d Happiness
20s 0d 20s 1d Misery

Figure 11. Tabular alignment with tabbing

The `tabbing` environment overcomes this problem. Within it you set tabstops and tab to them much like you do on a typewriter. Tabstops are set with the `\=` command, and the `\>` command moves to the next stop. The `\\` command is used to separate each line. A line that ends `\kill` produces no output, and can be used to set tabstops: Now see what happens in the example in Figure 11

Unlike a typewriter's tab key, the `\>` command always moves to the next tabstop in sequence, even if this means moving to the left. This can cause text to be overwritten if the gap between two tabstops is too small.

3.7 Tabular Alignment with the Tabular Environment

Tabular alignments may also be created with the `tabular` environment. See Figure 12 for an example. In that example, the argument in curly brackets following the `\begin{tabular}` indicates how many columns, how the items are to be placed in each of those columns, and whether there are vertical separators. In this example, `{|r|c|r|}` indicates that there is to be

three columns, the first and third column are to be right justified and the second column is to be centered. Each of the columns are to be separated by vertical lines, as indicated by the `|`. The `\hline` indicates the presence of horizontal lines. Within the body of the table, `&` is used to separate the fields from each other, and `\\` indicates the end of a line. The `\multicolumn` command is used to create entries which span across several fields, with its own formatting instructions. As you can see from the example, footnotes may be created within tables, but not with the ordinary `\footnote` command. The `\footnote` command is used to create numbered footnotes in the text that appear at the bottom of the page, but a manual process, such as shown in the example, is required to create a lower-case lettered footnote in a table that then appears at the bottom of the table.

3.8 Verbatim Output

Sometimes you will want to include text exactly as it appears on a terminal screen. For example, you might want to include part of a computer program. Not only do you want LaTeX to stop playing around with the layout of your text, you also want to be able to type all the characters on your keyboard without confusing LaTeX. The `verbatim` environment has this effect, as shown in Figure 13.

3.9 Mathematical Expressions

The great appeal of the LaTeX typesetting is its ability to typeset mathematical expressions of almost any complexity with ease. This document will not go into the details of how such typesetting is to be done — it would take a much longer work than this. However, it should be noted here that there are three basic kinds of mathematical typesetting. First, there is

```
\begin{tabular}{|r|c|r|}
\hline
\multicolumn{3}{|c|}{AT\&T Common Stock}
   \\ \hline
Year&Price&Dividend\\ \hline
1971&41--54&\$2.60\\ \hline
2&41--54&2.70\\ \hline
3&46--55&2.87\\ \hline
4&40--53&3.24\\ \hline
5&45--52&3.40\\ \hline
6&51--59&.95\rlap{$^{a}$}\\ \hline
\multicolumn{3}{l}
 {$^{a}$\small (first quarter only)}
\end{tabular}
```

AT&T Common Stock		
Year	Price	Dividend
1971	41–54	$2.60
2	41–54	2.70
3	46–55	2.87
4	40–53	3.24
5	45–52	3.40
6	51–59	.95[a]

[a] (first quarter only)

Figure 12. Tabular alignment with tabular

```
The section of program in
question is:
\begin{verbatim}
{ this finds %a & %b }

for i := 1 to 27 do
  begin
  table[i] := fn(i);
  process(i)
  end;
\end{verbatim}
```

The section of program in question is:

```
{ this finds %a & %b }


for i := 1 to 27 do
   begin
   table[i] := fn(i);
   process(i)
   end;
```

Figure 13. Creating a verbatim environment

the in-text mode, produced by the `math` environment. This produces a math expression right within a sentence. It can be produced by `\begin{math}...\end{math}`, or more frequently, by one of two short forms, `\(...\)` or `$...$`. The `displaymath` environment produces unnumbered displayed formulas, that is, formulas that are set off by themselves, centered on a line by themselves. It can be produced by `\begin{displaymath}...\end{displaymath}` or by the short form `\[...\]`. A third variation is the `equation` environment, produced by `\begin{equation}...\end{equation}` (there is no short form for this environment), which are like the displayed equations above, but are numbered. Such equations may be symbolically identified by the `\label` command and refered to in the text with the `\ref` command. By default, the equations are chapter-relative numbered, i.e. the designation `m.n` indicates that

this is the nth equation in Chapter m. As an option, the user may include the command `\abseqnumberingtrue` in the preamble to produce absolute numbered equations, in which no chapter designation occurs and the equation numbers increase through the entire document.

CHAPTER 4

ERRORS

When you create a new input file for LaTeX you will probably make mistakes. Everybody does, and it's nothing to be worried about. As with most computer programs, there are two sorts of mistake that you can make: those that LaTeX notices and those that it doesn't. To take a rather silly example, since LaTeX doesn't understand what you are saying it isn't going to be worried if you misspell some of the words in your text. You will just have to accurately proofread your printed output. On the other hand, if you misspell one of the environment names in your file then LaTeX won't know what you want it to do.

When this sort of thing happens, LaTeX prints an error message on your terminal screen and then stops and waits for you to take some action. Unfortunately, the error messages that it produces are rather user-unfriendly. Nevertheless, if you know where to look they will probably tell you where the error is and what went wrong.

For example, consider what would happen if you mistyped `\begin{itemize}` so that it became `\begin{itemie}`. When LaTeX processes this instruction, it displays the text shown in Figure 14. After typing the '?' LaTeX stops and waits for you to tell it what to do.

The first two lines of the message just tell you that the error was detected by LaTeX. The third line, the one that starts '!' is the *error indicator*. It tells you what the problem is, though until you have had some experience of LaTeX this may not mean a lot to you. In this case it is just telling you that it doesn't recognize an environment called `itemie`. The next two lines

```
LaTeX error.  See LaTeX manual for explanation.

              Type  H <return>  for immediate help.

! Environment itemie undefined.

\@latexerr ...for immediate help.}\errmessage {#1}

                                                  \endgroup

l.140 \begin{itemie}


?
```

Figure 14. Latex error report

tell you what LaTeX was doing when it found the error, they are irrelevant at the moment and can be ignored. The final line is called the *error locator*, and is a copy of the line from your file that caused the problem. It starts with a line number to help you to find it in your file, and if the error was in the middle of a line it will be shown broken at the point where LaTeX realized that there was an error. LaTeX can sometimes pass the point where the real error is before discovering that something is wrong, but it usually doesn't get very far.

At this point you could do several things. If you knew enough about LaTeX you might be able to fix the problem, or you could type 'X' and press the return key to stop LaTeX running while you go and correct the error. The best thing to do, however, is just to press the return key. This will allow LaTeX to go on running as if nothing had happened. If you have made one mistake, then you have probably made several and you may as well try to find them all in one

go. It's much more efficient to do it this way than to run LaTeX over and over again fixing one error at a time. Don't worry about remembering what the errors were—a copy of all the error messages is being saved in a *log* file so that you can look at them afterwards. On CMS, the log file has the same name as the file to be processed, but the file type is `TEXLOG`.

If you look at the line that caused the error it's usually obvious what the problem was. If you can't work out what your problem is look at the hints below, and if they don't help consult Chapter 6 of the manual. It contains a list of all of the error messages that you are likely to encounter together with some hints as to what may have caused them.

Some of the most common mistakes that cause errors are:

1. A misspelt command or environment name.
2. Improperly matched '`{`' and '`}` —remember that they should always come in pairs.
3. Trying to use one of the ten special characters `# $ % & _ { } ~ ^` and `\` as an ordinary printing symbol.
4. A missing `\end` command.
5. A missing command argument (that's the bit enclosed in '`{`' and '`}`').

One error can get LaTeX so confused that it reports a series of spurious errors as a result. If you have an error that you understand, followed by a series that you don't, try correcting the first error—the rest may vanish as if by magic.

Sometimes LaTeX may write a * and stop without an error message. This is normally caused by a missing `\end{document}` command, but other errors can cause it. If this happens type `\stop` and press the return key.

Finally, LaTeX will sometimes print *warning* messages. They report problems that were not bad enough to cause LaTeX to stop processing, but nevertheless may require investigation. The most common problems are 'overfull' and 'underfull' lines of text. A message like:

```
Overfull \hbox (10.58649pt too wide) in paragraph at lines 172--175
[]\tenrm Mathematical for-mu-las may be dis-played. A dis-played
```

indicates that LaTeX could not find a good place to break a line when laying out a paragraph. As a result, it was forced to let the line stick out into the right-hand margin, in this case by 10.6 points. Since a point is about 1/72nd of an inch this may be rather hard to see, but it will be there none the less.

This particular problem happens because LaTeX is rather fussy about line breaking, and it would rather generate a line that is too long than generate a paragraph that doesn't meet its high standards. The simplest way around the problem is to enclose the entire offending paragraph between `\begin{sloppypar}` and `\end{sloppypar}` commands. This tells LaTeX that you are happy for it to break its own rules while it is working on that particular bit of text.

Alternatively, messages about "Underfull `\hbox'es''` may appear. These are lines that had to have more space inserted between words than LaTeX would have liked. In general there is

not much that you can do about these. Your output will look fine, even if the line looks a bit stretched. About the only thing you could do is re-write the offending paragraph!

CHAPTER 5

BUGS

There are a few known bugs in LaTeX that occur very seldom and cause the user little trouble, but would be very difficult to fix. Moreover, given the nature of complex systems, it is likely that the corrections would lead to even worse problems. Therefore, these bugs will probably not be fixed.

The bugs and ways to get around them are listed below. Do not worry about any of them until you are preparing the final draft, since changes to the text are very likely to cause the problem to disappear.

1. In rare instances, a figure or table will be printed on the page preceding the text where the `figure` or `table` environment appears. This can be fixed by moving the environment further towards the end of the document.

2. A footnote can be broken across two pages when it should fit on a single page. This happens when there is one or more figures or tables on the page. The problem is corrected by moving, towards the end of the file, the last `figure` or `table` environment that produces a figure or table on the page where the footnote starts.

3. If you prepare your `TEX` file from a PC connected to UICVM with Telnet, incorrect codes will be generated for `{` and `}`. To correct all instances of incorrectly encoded braces, give the command `CURLYFIX` from the Xedit command line. This will not alter the future

encoding of these symbols, only correct the existing braces. You must be connected to the `TEXTOOLS` disk before the `CURLYFIX` command can be used. Make sure to use the command `GETDISK TEXTOOLS` before you use `CURLYFIX`.

CHAPTER 6

A FINAL REMINDER

You now know enough LaTeX to produce a wide range of documents. But this document has only scratched the surface of the things that LaTeX can do. In particular, now that LaTeX2$_\epsilon$ has been released it would be a very good idea buy or borrow an up to date reference manual.

This entire document was itself produced with LaTeX 2$_\epsilon$ and UICTHESIS (with no sticking things in or clever use of a photocopier) and even it hasn't used all the features that it could. From this you may get some feeling for the power that LaTeX puts at your disposal.

Please remember what was said in the introduction: if you **do** have a complex document to produce then **go and read the manual**(1) You will be wasting your time if you rely only on what you have read here.

One other warning: having dabbled with LaTeX your documents will never be the same again ....

APPENDICES

Appendix A

TYPE SIZES

Almost all the symbols available on our fonts can be generated by ordinary LaTeX commands. However, there are type sizes not obtainable by LaTeX's size-changing commands with the ordinary document styles. Consult a local Word Processing Consultant to find the TeX name for such a font.

Table I and Table II allow you to determine if the font for a type style at a particular size is preloaded, loaded on demand, or unavailable. Table I tells you what size of type is used for each LaTeX type-size command in the various document-style options. For example, with the `12pt` option, the `\large` declaration causes LaTeX to use 14pt type. Table II tells, for every type size, to which class of fonts each type style belongs. For example, in 14pt type, `\bf` uses a preloaded font and the other five type-style commands use load-on-demand fonts. Roman (`\rm`) and math italic (`\mit`) fonts are all preloaded; the `\em` declaration uses either italic (`\it`) or roman.

Appendix A (Continued)

This is tiny

This is scriptsize

This is footnotesize

This is small

This is normalsize

This is large

This is Large

This is LARGE

This is huge

This is Huge

Figure 15. Font Size Samples

Appendix A (Continued)

TABLE I

TYPE SIZES FOR LaTeX SIZE-CHANGING COMMANDS

	LaTeX default	UICTHESIS default	LaTeX option
size	10pt	11pt	12pt
`\tiny`	5pt	6pt	6pt
`\scriptsize`	7pt	8pt	8pt
`\footnotesize`	8pt	9pt	10pt
`\small`	9pt	10pt	11pt
`\normalsize`	10pt	11pt	12pt
`\large`	12pt	12pt	14pt
`\Large`	14pt	14pt	17pt
`\LARGE`	17pt	17pt	20pt
`\huge`	20pt	20pt	25pt
`\Huge`	25pt	25pt	25pt

Appendix A (Continued)

TABLE II

FONT CLASSES: P = PRELOADED, D = LOADED ON DEMAND, X = UNAVAILABLE.

	\it	\bf	\sl	\sf	\sc	\tt
5pt	X	D	X	X	X	X
6pt	X	D	X	X	X	X
7pt	P	D	X	X	X	X
8pt	P	D	D	D	D	D
9pt	P	P	D	D	D	P
10pt	P	P	P	P	D	P
11pt	P	P	P	P	D	P
12pt	P	P	P	P	D	P
14pt	D	P	D	D	D	D
17pt	D	P	D	D	D	D
20pt	D	D	D	D	D	D
25pt	X	D	X	X	D	X

Appendix B

STANDARD TYPE STYLES

The biggest change to experienced users of LaTeX with the new version is the new font selection system. Details of how the new system works are not included here, but can be found on the TeX disk as `AMSLATEX PS` and `FONTSEL PS`. These are PostScript files that may be printed on any of the Computer Center's remote PostScript printers.

Remember that these commands are used *inside* a pair of braces to limit the amount of text that they effect.

Figure 16 through Figure 20 contain examples of some of the more common LaTeX type styles. Figure 16 shows the `cmr` or Computer Modern Roman family, Figure 17 shows the bold versions of these fonts, Figure 18 shows the `cmss` or Computer Modern Sans Serif family, Figure 19 shows the `cmtt` or Computer Modern Typewriter family, and Figure 20 shows the `cmm` or Computer Modern Math Italic family.

Appendix B (Continued)

This is what is produced when the type style is declared with:
`\rm\normalshape\mediumseries`
or, with the new font selection scheme:
`\fontfamily{cmr}\fontshape{n}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\rm\sl\mediumseries`
or, with the new font selection scheme:
`\fontfamily{cmr}\fontshape{sl}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\rm\it\mediumseries`
or, with the new font selection scheme:
`\fontfamily{cmr}\fontshape{it}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\rm\sc\mediumseries`
or, with the new font selection scheme:
`\fontfamily{cmr}\fontshape{sc}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\rm\u\mediumseries`
or, with the new font selection scheme:
`\fontfamily{cmr}\fontshape{u}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

Figure 16. Computer Modern Roman Fonts

Appendix B (Continued)

This is what is produced when the type style is declared with the new font selection scheme as:

```
\fontfamily{cmr}\fontshape{n}\fontseries{b}\selectfont
```

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:

```
\rm\normalshape\bf
```

or, with the new font selection scheme:

```
\fontfamily{cmr}\fontshape{n}\fontseries{bx}\selectfont
```

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:

```
\rm\sl\bf
```

or, with the new font selection scheme:

```
\fontfamily{cmr}\fontshape{sl}\fontseries{bx}\selectfont
```

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:

```
\rm\it\bf
```

or, with the new font selection scheme:

```
\fontfamily{cmr}\fontshape{it}\fontseries{bx}\selectfont
```

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

Figure 17. Computer Modern Bold Roman Fonts

Appendix B (Continued)

This is what is produced when the type style is declared with:
`\sf\normalshape\mediumseries`
or, with the new font selection scheme:
`\fontfamily{cmss}\fontshape{n}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\sf\sl\mediumseries`
or, with the new font selection scheme:
`\fontfamily{cmss}\fontshape{sl}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\fontfamily{cmss}\fontshape{n}\fontseries{sbc}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\sf\normalshape\bf`
or, with the new font selection scheme:
`\fontfamily{cmss}\fontshape{n}\fontseries{bx}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

Figure 18. Computer Modern Sans Serif Fonts

Appendix B (Continued)

This is what is produced when the type style is declared with:
`\tt\normalshape\mediumseries`
or, with the new font selection scheme:
`\fontfamily{cmtt}\fontshape{n}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ
1234567890

This is what is produced when the type style is declared with:
`\tt\it\mediumseries`
or, with the new font selection scheme:
`\fontfamily{cmtt}\fontshape{it}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ
1234567890

This is what is produced when the type style is declared with:
`\tt\sl\mediumseries`
or, with the new font selection scheme:
`\fontfamily{cmtt}\fontshape{sl}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ
1234567890

This is what is produced when the type style is declared with:
`\tt\sc\mediumseries`
or, with the new font selection scheme:
`\fontfamily{cmtt}\fontshape{sc}\fontseries{m}\selectfont`

ABC DEF GHI JKL MNO PQR STU VWX YZ ABC DEF GHI JKL MNO PQR STU VWX YZ
1234567890

Figure 19. Computer Modern Typewriter Fonts

Appendix B (Continued)

This is what is produced when the type style is declared with:
`\fontfamily{cmm}\fontshape{it}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\fontfamily{cmm}\fontshape{it}\fontseries{b}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

Figure 20. Computer Modern Math Italic

Appendix C

$\mathcal{AMS}$-LaTeX TYPE STYLES

Figure 21 through Figure 24 contain examples of some of the more common $\mathcal{AMS}$-LaTeX type styles. To obtain these fonts, the style option `amsfonts`, `amssymb`, or `amstex` must be used. Figure 21 shows the `ccr` or Concrete Roman family, Figure 22 shows the `eur` or Euler Roman family, Figure 23 shows the `eus` or Euler Script family, and Figure 24 shows the `euf` or Euler Fraktur family.

Appendix C (Continued)

This is what is produced when the type style is declared with:
`\fontfamily{ccr}\fontshape{n}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\fontfamily{ccr}\fontshape{it}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\fontfamily{ccr}\fontshape{sc}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

Figure 21. Concrete Roman Fonts

This is what is produced when the type style is declared with:
`\fontfamily{eur}\fontshape{n}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\fontfamily{eur}\fontshape{n}\fontseries{b}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

Figure 22. Euler Roman Fonts

Appendix C (Continued)

This is what is produced when the type style is declared with:
`\fontfamily{eus}\fontshape{n}\fontseries{m}\selectfont`

ABC DEF GHI JKL MNO PQR STU VWX YZ

This is what is produced when the type style is declared with:
`\fontfamily{eus}\fontshape{n}\fontseries{b}\selectfont`

ABC DEF GHI JKL MNO PQR STU VWX YZ

Figure 23. Euler Script Fonts

This is what is produced when the type style is declared with:
`\fontfamily{euf}\fontshape{n}\fontseries{m}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

This is what is produced when the type style is declared with:
`\fontfamily{euf}\fontshape{n}\fontseries{b}\selectfont`

abc def ghi jkl mno pqr stu vwx yz ABC DEF GHI JKL MNO PQR STU VWX YZ 1234567890

Figure 24. Euler Fractur Fonts

Appendix D

STANDARD SYMBOLS

You can include in your LaTeX document a wide range of symbols that do not appear on your keyboard. Table III through Table XIII include the special symbols that may be contained in any LaTeX document. Table III demonstrates how an accent may be added to any letter.

A number of other symbols are available, and can be used by including the commands shown in tables Table IV through Table XIII. The symbols for all the tables starting with table Table V are available only in math mode. The symbols shown in table Table XIII, while part of standard LaTeX, are only available if the style option `newlfont` is declared.

There is also a `\today` command that prints the current date. When you use these commands remember that LaTeX will ignore any spaces that follow them, so that you can type '`\pounds 20`' to get '£20'. However, if you type '`LaTeX is wonderful`' you will get 'LaTeXis wonderful'—notice the lack of space after LaTeX. To overcome this problem you can follow any of these commands by a pair of empty brackets and then any spaces that you wish to include, and you will see that `\LaTeX{} really is wonderful!` (LaTeX really is wonderful!).

Appendix D (Continued)

TABLE III

ACCENTING CHARACTERS

ò	\‘{o}	õ	\~{o}	ǒ	\v{o}	o̧	\c{o}
ó	\’{o}	ō	\={o}	ő	\H{o}	ọ	\d{o}
ô	\^{o}	ȯ	\.{o}	o͡o	\t{oo}	o̲	\b{o}
ö	\"{o}	ŏ	\u{o}				

TABLE IV

SPECIAL SYMBOLS IN TEXT MODE

†	\dag	§	\S	©	\copyright
‡	\ddag	¶	\P	£	\pounds
œ	\oe	Œ	\OE	æ	\AE
Æ	\AE	å	\aa	Å	\AA
ø	\o	Ø	\O	ł	\l
Ł	\E	ß	\ss	¿	?‘
¡	!‘	…	\ldots	LaTeX	\LaTeX

Appendix D (Continued)

TABLE V

LOWER-CASE GREEK

α	\alpha	θ	\theta	o	o	τ	\tau
β	\beta	ϑ	\vartheta	π	\pi	υ	\upsilon
γ	\gamma	ι	\iota	ϖ	\varpi	ϕ	\phi
δ	\delta	κ	\kappa	ρ	\rho	φ	\varphi
ϵ	\epsilon	λ	\lambda	ρ	\varrho	χ	\chi
ε	\varepsilon	μ	\mu	σ	\sigma	ψ	\psi
ζ	\zeta	ν	\nu	σ	\varsigma	ω	\omega
η	\eta	ξ	\xi				

TABLE VI

UPPER-CASE GREEK

Γ	\Gamma	Λ	\Lambda	Σ	\Sigma	Ψ	\Psi
Δ	\Delta	Ξ	\Xi	Υ	\Upsilon	Ω	\Omega
Θ	\Theta	Π	\Pi	Φ	\Phi		

Appendix D (Continued)

TABLE VII

CALLIGRAPHIC LETTERS

$\mathcal{A}$	\cal A	$\mathcal{H}$	\cal H	$\mathcal{O}$	\cal O	$\mathcal{U}$	\cal U
$\mathcal{B}$	\cal B	$\mathcal{I}$	\cal I	$\mathcal{P}$	\cal P	$\mathcal{V}$	\cal V
$\mathcal{C}$	\cal C	$\mathcal{J}$	\cal J	$\mathcal{Q}$	\cal Q	$\mathcal{W}$	\cal W
$\mathcal{D}$	\cal D	$\mathcal{K}$	\cal K	$\mathcal{R}$	\cal R	$\mathcal{X}$	\cal X
$\mathcal{E}$	\cal E	$\mathcal{L}$	\cal L	$\mathcal{S}$	\cal S	$\mathcal{Y}$	\cal Y
$\mathcal{F}$	\cal F	$\mathcal{M}$	\cal M	$\mathcal{T}$	\cal T	$\mathcal{Z}$	\cal Z
$\mathcal{G}$	\cal G	$\mathcal{N}$	\cal N				

Appendix D (Continued)

TABLE VIII

BINARY OPERATION SYMBOLS

$\pm$	\pm	$\cap$	\cap	$\diamond$	\diamond	$\oplus$	\oplus
$\mp$	\mp	$\cup$	\cup	$\triangle$	\bigtriangleup	$\ominus$	\ominus
$\times$	\times	$\uplus$	\uplus	$\triangledown$	\bigtriangledown	$\otimes$	\otimes
$\div$	\div	$\sqcap$	\sqcap	$\triangleleft$	\triangleleft	$\oslash$	\oslash
$*$	\ast	$\sqcup$	\sqcup	$\triangleright$	\triangleright	$\odot$	\odot
$\star$	\star	$\vee$	\vee	$\bigcirc$	\bigcirc	$\circ$	\circ
$\wedge$	\wedge	$\dagger$	\dagger	$\bullet$	\bullet	$\setminus$	\setminus
$\ddagger$	\ddagger	$\cdot$	\cdot	$\wr$	\wr	$\amalg$	\amalg

Appendix D (Continued)

TABLE IX

RELATION SYMBOLS

$\leq$	\leq	$\geq$	\geq	$\equiv$	\equiv	$\models$	\models
$\prec$	\prec	$\succ$	\succ	$\sim$	\sim	$\perp$	\perp
$\preceq$	\preceq	$\succeq$	\succeq	$\simeq$	\simeq	$\mid$	\mid
$\subset$	\subset	$\supset$	\supset	$\approx$	\approx	$\bowtie$	\bowtie
$\subseteq$	\subseteq	$\supseteq$	\supseteq	$\cong$	\cong	$\neq$	\neq
$\smile$	\smile	$\sqsubseteq$	\sqsubseteq	$\sqsupseteq$	\sqsupseteq	$\doteq$	\doteq
$\frown$	\frown	$\in$	\in	$\ni$	\ni	$\vdash$	\vdash
$\dashv$	\dashv	$\propto$	\propto				

Appendix D (Continued)

TABLE X

ARROW SYMBOLS

$\leftarrow$	\leftarrow	$\longleftarrow$	\longleftarrow	$\uparrow$	\uparrow
$\Leftarrow$	\Leftarrow	$\Longleftarrow$	\Longleftarrow	$\Uparrow$	\Uparrow
$\rightarrow$	\rightarrow	$\longrightarrow$	\longrightarrow	$\downarrow$	\downarrow
$\Rightarrow$	\Rightarrow	$\Longrightarrow$	\Longrightarrow	$\Downarrow$	\Downarrow
$\leftrightarrow$	\leftrightarrow	$\longleftrightarrow$	\longleftrightarrow	$\updownarrow$	\updownarrow
$\Leftrightarrow$	\Leftrightarrow	$\Longleftrightarrow$	\Longleftrightarrow	$\Updownarrow$	\Updownarrow
$\mapsto$	\mapsto	$\longmapsto$	\longmapsto	$\nearrow$	\nearrow
$\hookleftarrow$	\hookleftarrow	$\hookrightarrow$	\hookrightarrow	$\searrow$	\searrow
$\leftharpoonup$	\leftharpoonup	$\rightharpoonup$	\rightharpoonup	$\swarrow$	\swarrow
$\leftharpoondown$	\leftharpoondown	$\rightharpoondown$	\rightharpoondown	$\nwarrow$	\nwarrow
$\rightleftharpoons$	\rightleftharpoons				

Appendix D (Continued)

TABLE XI

MISCELLANEOUS SYMBOLS

$\aleph$	\aleph	$\prime$	\prime	$\forall$	\forall	∞	\infty
$\hbar$	\hbar	$\emptyset$	\emptyset	$\exists$	\exists	$\imath$	\imath
∇	\nabla	$\neg$	\neg	$\jmath$	\jmath	$\surd$	\surd
$\flat$	\flat	$\triangle$	\triangle	ℓ	\ell	$\top$	\top
$\natural$	\natural	$\clubsuit$	\clubsuit	$\wp$	\wp	$\bot$	\bot
$\sharp$	\sharp	$\diamondsuit$	\diamondsuit	$\Re$	\Re	$\|$	\—
\	\backslash	$\heartsuit$	\heartsuit	$\Im$	\Im	$\angle$	\angle
∂	\partial	$\spadesuit$	\spadesuit				

Appendix D (Continued)

TABLE XII

VARIABLE-SIZED SYMBOLS

Σ	$\sum$	\sum	$\cap$	$\bigcap$	\bigcap	$\odot$	$\bigodot$	\bigodot
Π	$\prod$	\prod	$\cup$	$\bigcup$	\bigcup	$\otimes$	$\bigotimes$	\bigotimes
$\amalg$	$\coprod$	\coprod	$\sqcup$	$\bigsqcup$	\bigsqcup	$\oplus$	$\bigoplus$	\bigoplus
$\int$	$\int$	\int	$\vee$	$\bigvee$	\bigvee	$\uplus$	$\biguplus$	\biguplus
$\oint$	$\oint$	\oint	$\wedge$	$\bigwedge$	\bigwedge			

TABLE XIII

LaTeX SYMBOLS

$\lhd$	\lhd	$\rhd$	\rhd	$\unlhd$	\unlhd	$\unrhd$	\unrhd
$\sqsubset$	\sqsubset	$\sqsupset$	\sqsupset	$\bowtie$	\Join	$\leadsto$	\leadsto
$\Box$	\Box	$\Diamond$	\Diamond	$\mho$	\mho		

These symbols, while part of standard LaTeX, are only available if the style option `newlfont` is declared.

Appendix E

$\mathcal{AMS}$-LaTeX SYMBOLS

One of the most important features of $\mathcal{AMS}$-LaTeX is its expanded range of mathematical symbols. In this section, we have included all those extra symbols along with the codes that generate them. For these symbols to be available, include the `amssymb`, `amsfonts`, and `euler` packages with the `\usepackage` command. Table XIV through Table XXIII include the special symbols that are available

TABLE XIV

LOWERCASE GREEK LETTERS

$\digamma$	\digamma	$\varkappa$	\varkappa

Appendix E (Continued)

TABLE XV

ITALIC UPPER-CASE GREEK

Γ	\mit{\Gamma}	Λ	\mit{\Lambda}	Σ	\mit{\Sigma}	Ψ	\mit{\Psi}
Δ	\mit{\Delta}	Ξ	\mit{\Xi}	Υ	\mit{\Upsilon}	Ω	\mit{\Omega}
Θ	\mit{\Theta}	Π	\mit{\Pi}	Φ	\mit{\Phi}		

TABLE XVI

BOLD UPPER-CASE GREEK

Γ	\bold{\Gamma}	Λ	\bold{\Lambda}	Σ	\bold{\Sigma}	Ψ	\bold{\Psi}
Δ	\bold{\Delta}	Ξ	\bold{\Xi}	Υ	\bold{\Upsilon}	Ω	\bold{\Omega}
Θ	\bold{\Theta}	Π	\bold{\Pi}	Φ	\bold{\Phi}		

Appendix E (Continued)

TABLE XVII

HEBREW LETTERS

ב	\beth	ג	\gimel	ד	\daleth

TABLE XVIII

EULER FRACTUR LETTERS

$\mathfrak{A}$	\mathfrak A	$\mathfrak{H}$	\mathfrak H	$\mathfrak{O}$	\mathfrak O	$\mathfrak{U}$	\mathfrak U
$\mathfrak{B}$	\mathfrak B	$\mathfrak{I}$	\mathfrak I	$\mathfrak{P}$	\mathfrak P	$\mathfrak{V}$	\mathfrak V
$\mathfrak{C}$	\mathfrak C	$\mathfrak{J}$	\mathfrak J	$\mathfrak{Q}$	\mathfrak Q	$\mathfrak{W}$	\mathfrak W
$\mathfrak{D}$	\mathfrak D	$\mathfrak{K}$	\mathfrak K	$\mathfrak{R}$	\mathfrak R	$\mathfrak{X}$	\mathfrak X
$\mathfrak{E}$	\mathfrak E	$\mathfrak{L}$	\mathfrak L	$\mathfrak{S}$	\mathfrak S	$\mathfrak{Y}$	\mathfrak Y
$\mathfrak{F}$	\mathfrak F	$\mathfrak{M}$	\mathfrak M	$\mathfrak{T}$	\mathfrak T	$\mathfrak{Z}$	\mathfrak Z
$\mathfrak{G}$	\mathfrak G	$\mathfrak{N}$	\mathfrak N				

Appendix E (Continued)

TABLE XIX

BLACKBOARD BOLD LETTERS

$\mathbb{A}$	\mathbb A	$\mathbb{H}$	\mathbb H	$\mathbb{O}$	\mathbb O	$\mathbb{U}$	\mathbb U
$\mathbb{B}$	\mathbb B	$\mathbb{I}$	\mathbb I	$\mathbb{P}$	\mathbb P	$\mathbb{V}$	\mathbb V
$\mathbb{C}$	\mathbb C	$\mathbb{J}$	\mathbb J	$\mathbb{Q}$	\mathbb Q	$\mathbb{W}$	\mathbb W
$\mathbb{D}$	\mathbb D	$\mathbb{K}$	\mathbb K	$\mathbb{R}$	\mathbb R	$\mathbb{X}$	\mathbb X
$\mathbb{E}$	\mathbb E	$\mathbb{L}$	\mathbb L	$\mathbb{S}$	\mathbb S	$\mathbb{Y}$	\mathbb Y
$\mathbb{F}$	\mathbb F	$\mathbb{M}$	\mathbb M	$\mathbb{T}$	\mathbb T	$\mathbb{Z}$	\mathbb Z
$\mathbb{G}$	\mathbb G	$\mathbb{N}$	\mathbb N				

Appendix E (Continued)

TABLE XX

MISCELLANEOUS SYMBOLS

$\hbar$	\hbar	$\hslash$	\hslash	$\backprime$	\backprime
$\vartriangle$	\vartriangle	$\blacktriangle$	\blacktriangle	$\varnothing$	\varnothing
$\triangledown$	\triangledown	$\blacktriangledown$	\blacktriangledown	$\circledS$	\circledS
$\square$	\square	$\blacksquare$	\blacksquare	$\bigstar$	\bigstar
$\lozenge$	\lozenge	$\blacklozenge$	\blacklozenge	$\nexists$	\nexists
$\angle$	\angle	$\sphericalangle$	\sphericalangle	$\measuredangle$	\measuredangle
$\complement$	\complement	$\mho$	\mho	$\eth$	\eth

Appendix E (Continued)

TABLE XXI

BINARY OPERATORS

$\dot{+}$	\dotplus	$\ltimes$	\ltimes	$\setminus$	\smallsetminus
$\rtimes$	\rtimes	$\Cap$	\doublecap	$\Cup$	\doublecup
$\leftthreetimes$	\leftthreetimes	$\rightthreetimes$	\rightthreetimes	$\barwedge$	\barwedge
$\curlywedge$	\curlywedge	$\veebar$	\veebar	$\curlyvee$	\curlyvee
$\doublebarwedge$	\doublebarwedge	$\boxminus$	\boxminus	$\circleddash$	\circleddash
$\boxtimes$	\boxtimes	$\circledast$	\circledast	$\boxdot$	\boxdot
$\circledcirc$	\circledcirc	$\boxplus$	\boxplus	$\centerdot$	\centerdot
$\divideontimes$	\divideontimes	$\intercal$	\intercal		

Appendix E (Continued)

TABLE XXII

BINARY RELATIONS

$\leqq$	\leqq	$\geqq$	\geqq	$\lessapprox$	\lessapprox
$\leqslant$	\leqslant	$\geqslant$	\geqslant	$\gtrapprox$	\gtrapprox
$\eqslantless$	\eqslantless	$\eqslantgtr$	\eqslantgtr	$\approxeq$	\approxeq
$\lesssim$	\lesssim	$\gtrsim$	\gtrsim	$\ggg$	\gggtr
$\lessdot$	\lessdot	$\gtrdot$	\gtrdot	$\lll$	\llless
$\lessgtr$	\lessgtr	$\gtrless$	\gtrless	$\doteqdot$	\doteqdot
$\lesseqgtr$	\lesseqgtr	$\gtreqless$	\gtreqless	$\eqcirc$	\eqcirc
$\lesseqqgtr$	\lesseqqgtr	$\gtreqqless$	\gtreqqless	$\circeq$	\circeq
$\risingdotseq$	\risingdotseq	$\fallingdotseq$	\fallingdotseq	$\backsim$	\backsim
$\triangleq$	\triangleq	$\thicksim$	\thicksim	$\backsimeq$	\backsimeq
$\subseteqq$	\subseteqq	$\supseteqq$	\supseteqq	$\thickapprox$	\thickapprox
$\Subset$	\Subset	$\Supset$	\Supset	$\preccurlyeq$	\preccurlyeq
$\sqsubset$	\sqsubset	$\sqsupset$	\sqsupset	$\succcurlyeq$	\succcurlyeq
$\precsim$	\precsim	$\succsim$	\succsim	$\curlyeqsucc$	\curlyeqsucc
$\precapprox$	\precapprox	$\succapprox$	\succapprox	$\vDash$	\vDash
$\vartriangleleft$	\vartriangleleft	$\vartriangleright$	\vartriangleright	$\Vdash$	\Vdash
$\trianglelefteq$	\trianglelefteq	$\trianglerighteq$	\trianglerighteq	$\Vvdash$	\Vvdash
$\smallsmile$	\smallsmile	$\shortmid$	\shortmid	$\smallfrown$	\smallfrown
$\bumpeq$	\bumpeq	$\between$	\between	$\Bumpeq$	\Bumpeq
$\shortparallel$	\shortparallel	$\pitchfork$	\pitchfork	$\varpropto$	\varpropto
$\backepsilon$	\backepsilon	$\blacktriangleleft$	\blacktriangleleft	$\blacktriangleright$	\blacktriangleright
$\therefore$	\therefore	$\because$	\because		

Appendix E (Continued)

TABLE XXIII

NEGATED RELATIONS

$\not<$	\nless	$\not>$	\ngtr	$\not\leq$	\nleq	$\not\geq$	\ngeq
$\not\leqslant$	\nleqslant	$\not\geqslant$	\ngeqslant	$\not\leqq$	\nleqq	$\not\geqq$	\ngeqq
$\lneq$	\lneq	$\gneq$	\gneq	$\lneqq$	\lneqq	$\gneqq$	\gneqq
$\lvertneqq$	\lvertneqq	$\gvertneqq$	\gvertneqq	$\lnsim$	\lnsim	$\gnsim$	\gnsim
$\lnapprox$	\lnapprox	$\gnapprox$	\gnapprox	$\not\prec$	\nprec	$\not\succ$	\nsucc
$\not\preceq$	\npreceq	$\not\succeq$	\nsucceq	$\precneqq$	\precneqq	$\succneqq$	\succneqq
$\precnsim$	\precnsim	$\succnsim$	\succnsim	$\precnapprox$	\precnapprox	$\succnapprox$	\succnapprox
$\not\sim$	\nsim	$\not\cong$	\ncong	$\nshortmid$	\nshortmid	$\nshortparallel$	\nshortparallel
$\nvdash$	\nvdash	$\nvDash$	\nvDash	$\nVdash$	\nVdash	$\nVDash$	\nVDash
$\not\triangleleft$	\ntriangleleft	$\not\triangleright$	\ntriangleright	$\not\trianglelefteq$	\ntrianglelefteq	$\not\trianglerighteq$	\ntrianglerighteq
$\not\subseteq$	\nsubseteq	$\not\supseteq$	\nsupseteq	$\not\subseteqq$	\nsubseteqq	$\not\supseteqq$	\nsupseteqq
$\subsetneq$	\subsetneq	$\supsetneq$	\supsetneq	$\varsubsetneq$	\varsubsetneq	$\varsupsetneq$	\varsupsetneq
$\subsetneqq$	\subsetneqq	$\supsetneqq$	\supsetneqq	$\varsubsetneqq$	\varsubsetneqq	$\varsupsetneqq$	\varsupsetneqq
$\nmid$	\nmid	$\nparallel$	\nparallel				

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VITA

This is where the vita goes. Its organization is left as an exercise. Hint: see the list of abbreviations.