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A thesis submitted in partial fulfillment of the  
**Honors in Mathematics distinction**

advised by

Dr. Stephen Strange  
Mathematics Department

**May 20XX**

*Abstract*



This is where you will put your abstract. This should be a paragraph that succinctly describes your paper. Do not treat this as an introduction. It should be a short description of your results, with enough details to make it understandable. Consult your thesis advisor if you have any questions.

## *Acknowledgements*

This is where you get the chance to thank anyone that you want who has helped you. Be sure to thank your thesis advisor and anyone else who has specifically helped you with this project. Some students also thank family, friends, and professors/advisors/mentors that have supported them throughout their time as an undergraduate.

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# 1 Introduction

This is your introduction to the topic of this honors thesis. At some point in this introduction, a clear and concise statement of the main result(s) should be given. In order to do this, it is often necessary to provide a historical background for the topic. You may want to cite works related to this thesis that have previously been published. For example, work related to knot mosaics might want to reference the work done by Heap and Knowles in [1] and by Dowker and Thistlethwaite in [2].

It is probably a good idea to provide any essential definitions that are needed to state the results. This does not mean that all definitions need to be given in the introduction but only those necessary for stating the primary result(s).

Always keep in mind that this thesis should be accessible to an undergraduate math student. Assume the reader has some basic level of general background knowledge but may not possess specific knowledge related to the topic of this thesis. Because of this, make sure to include clear definitions of technical terms used.

## 2 Learning L<sup>A</sup>T<sub>E</sub>X

L<sup>A</sup>T<sub>E</sub>X is not a “What You See is What You Get” program, unlike word processors such as Microsoft Word. Instead, a document written for L<sup>A</sup>T<sub>E</sub>X is actually a simple, plain text file that contains *no formatting*. You tell L<sup>A</sup>T<sub>E</sub>X how you want the formatting in the finished document by writing in simple commands amongst the text, for example, if I want to use *italic text for emphasis*, I write the ‘`\emph{}`’ command and put the text I want in italics in between the curly braces. This means that L<sup>A</sup>T<sub>E</sub>X is a “mark-up” language, very much like HTML.

### 2.1 An Introduction to L<sup>A</sup>T<sub>E</sub>X

If you are new to L<sup>A</sup>T<sub>E</sub>X, there is a very good eBook – freely available online as a PDF file – called, “The Not So Short Introduction to L<sup>A</sup>T<sub>E</sub>X”. The book’s title is typically shortened to just “lshort”. You can download the latest version (as it is occasionally updated) from here: <http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf>

You can also find a few helpful guides on the Math Department website at: [https://www.geneseo.edu/math/instructional\\_guides](https://www.geneseo.edu/math/instructional_guides)

### 2.2 A Short Math Guide for L<sup>A</sup>T<sub>E</sub>X

If you are writing a technical or mathematical thesis, then you may want to read the document by the AMS (American Mathematical Society) called, “A Short Math Guide for L<sup>A</sup>T<sub>E</sub>X”. It can be found online here:

<http://www.ams.org/tex/amslatex.html>

under the “Additional Documentation” section towards the bottom of the page.

## 2.3 Common L<sup>A</sup>T<sub>E</sub>X Math Symbols

There are a multitude of mathematical symbols available for L<sup>A</sup>T<sub>E</sub>X and it would take a great effort to learn the commands for them all. The most common ones you are likely to use are shown on this page:

<http://www.sunilpatel.co.uk/latexsymbols.html>

You can use this page as a reference or crib sheet, the symbols are rendered as large, high quality images so you can quickly find the L<sup>A</sup>T<sub>E</sub>X command for the symbol you need.

## 3 Extra Files For This Template

Included are also several files and a ‘figures’ folder. Most of the files are plain text and you can see their contents in a text editor. Luckily, many of them are auxiliary files created by L<sup>A</sup>T<sub>E</sub>X or BibTeX and which you don’t need to bother about. First, the essential files/folders are:

- **figures** – this folder contains the all figures for the thesis. These are the final images that will go into the thesis document.
- **bibliography.bib** – this is an important file that contains all the bibliographic information and references that you will be citing in the thesis for use with BibTeX. You can write it manually, but there are reference manager programs available that will create and manage it for you. Bibliographies in L<sup>A</sup>T<sub>E</sub>X are a large subject and you may need to read about BibTeX before starting with this.
- **thesis.tex** – this is an important file, as it is where you will actually type and create your thesis. This is the file that you tell L<sup>A</sup>T<sub>E</sub>X to compile to produce your thesis as a PDF file. It contains the framework and constructs that tell L<sup>A</sup>T<sub>E</sub>X how to layout the thesis.

Files that are *not* included but are created by L<sup>A</sup>T<sub>E</sub>X as auxiliary files include:

- **thesis.pdf** – this is your beautifully typeset thesis (in the PDF file format) created by L<sup>A</sup>T<sub>E</sub>X.
- **thesis.aux** – this is an auxiliary file generated by L<sup>A</sup>T<sub>E</sub>X, if it is deleted L<sup>A</sup>T<sub>E</sub>X simply regenerates it when you run the main ‘.tex’ file.
- **thesis.bbl** – this is an auxiliary file generated by BibTeX, if it is deleted, BibTeX simply regenerates it when you run the main tex file. Whereas the ‘.bib’ file contains all the references you have, this ‘.bbl’ file contains the references you have actually cited in the thesis and is used to build the bibliography section of the thesis.
- **thesis.blg** – this is an auxiliary file generated by BibTeX, if it is deleted BibTeX simply regenerates it when you run the main ‘.tex’ file.

- **thesis.lof** – this is an auxiliary file generated by L<sup>A</sup>T<sub>E</sub>X, if it is deleted L<sup>A</sup>T<sub>E</sub>X simply regenerates it when you run the main ‘.tex’ file. It tells L<sup>A</sup>T<sub>E</sub>X how to build the ‘List of Figures’ section.
- **thesis.log** – this is an auxiliary file generated by L<sup>A</sup>T<sub>E</sub>X, if it is deleted L<sup>A</sup>T<sub>E</sub>X simply regenerates it when you run the main ‘.tex’ file. It contains messages from L<sup>A</sup>T<sub>E</sub>X, if you receive errors and warnings from L<sup>A</sup>T<sub>E</sub>X, they will be in this ‘.log’ file.
- **thesis.lot** – this is an auxiliary file generated by L<sup>A</sup>T<sub>E</sub>X, if it is deleted L<sup>A</sup>T<sub>E</sub>X simply regenerates it when you run the main ‘.tex’ file. It tells L<sup>A</sup>T<sub>E</sub>X how to build the ‘List of Tables’ section.
- **thesis.out** – this is an auxiliary file generated by L<sup>A</sup>T<sub>E</sub>X, if it is deleted L<sup>A</sup>T<sub>E</sub>X simply regenerates it when you run the main ‘.tex’ file.

Of all of the files, only the files with the ‘.bib’ and ‘.tex’ extensions are the most important ones. The other auxiliary files can be ignored or deleted as L<sup>A</sup>T<sub>E</sub>X and BibT<sub>E</sub>X will regenerate them.

## 4 The ‘thesis.tex’ File Explained

The **thesis.tex** file, known as the source file, contains the structure of the thesis. There are plenty of written comments that explain what pages, sections and formatting the L<sup>A</sup>T<sub>E</sub>X code is creating. Initially there seems to be a lot of L<sup>A</sup>T<sub>E</sub>X code, but this is all formatting, and it has all been taken care of so you don’t have to do it.

Begin by filling out your information for the title page and abstract. Next comes the acknowledgements. On this page, write about all the people who you wish to thank (not forgetting parents, partners and your advisor/supervisor).

The contents pages and optional list of figures are automatically taken care of for you and do not need manually creating or editing. If you do not want a list of figures, delete or comment out those lines.

After these preliminary features, your thesis will officially begin with the Introduction section. This is followed by whatever sections and/or subsections you might need.

The final piece of your thesis is the bibliography, called ‘References’, and will be populated automatically for you using the ‘bibliography.bib’ file and your use of the command ‘\cite{}’. The contents for the bibliography are stored in the file ‘bibliography.bib’. You can edit the bibliography.bib using a text editor and include as many entries in it as you want, even those that you do not cite in your thesis. The only references that will be listed in the bibliography are the ones you cite using ‘\cite{}’. Whatever you put in the braces, such as ‘\cite{example}’, is the name that you have given to the reference in bibliography.bib. In place of ‘example’, put the name given in your bibliography.bib file. In this case, the example citation refers to work done by Dr. Strange in [3].



## 4.1 Figures

There will hopefully be many figures in your thesis. All of the figure files should be placed in the ‘figures’ folder. The way to insert figures into your thesis is to use a code template like this:

```
\begin{figure}[h]
  \centering
  \includegraphics[width=.4\columnwidth]{knot.jpg}
  \caption[The Whitehead Link]{This is a picture of a knotted link.}
  \label{fig:knot}
\end{figure}
```

Putting this code into the source file (thesis.tex) produces the picture of the knot that you can see in the figure below, which we have labeled as Figure 1.

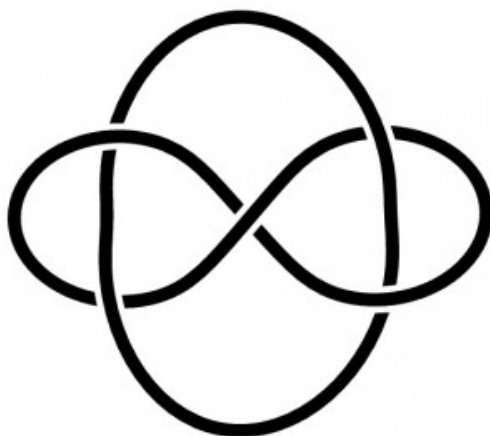


Figure 1: This is a picture of a knotted link.

Sometimes figures don’t always appear where you write them in the source. The placement depends on how much space there is on the page for the figure. Sometimes there is not enough room to fit a figure directly where it should go (in relation to the text) and so  $\text{\LaTeX}$  puts it at the top of the next page. Positioning figures is the job of  $\text{\LaTeX}$  and so you should only worry about making them look good!

Figures usually should have labels just in case you need to refer to them (such as in figure 1). The ‘`\caption`’ command contains two parts, the first part, inside the square brackets is the title that will appear in the ‘List of Figures’, and so should be short. The second part in the curly brackets should contain the longer and more descriptive caption text.

This template is able to use figures that are either in the PDF or JPG file format.

## 5 In Closing

You have reached the end of this mini-guide. You can now rename or overwrite this pdf file and begin writing your own text. The easy work of setting up the structure and framework

has been taken care of for you. It's now your job to fill it out! Good luck!

## References

- [1] Aaron Heap and Doug Knowles. Space-efficient knot mosaics for prime knots with mosaic number 6. *Involve*, 12(5), 2019.
- [2] M. B. Thistlethwaite C. H. Dowker. Classification of knot projections. *Topology and Its Applications*, 16, 1983.
- [3] Dr. Stephen Strange. Wielding the cloak of levitation. *Book of the Vishanti*, 42(3), 2016.