

Title of your thesis

Your Name

Department of Mathematics
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Supervisor: Your supervisor's name

A thesis submitted in partial fulfilment of the requirements for the degree of MSc/(MA) in
Mathematics (Applied Mathematics), The University of Auckland, 201X.

Abstract

Put your abstract here. The abstract should contain a brief summary of the aim, methodologies, finding and conclusions (if appropriate) of the thesis. The abstract should normally be fewer than 350 words.

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Chapter 1

Introduction

A thesis should always have an introduction. The purpose is to describe the general subject area, state the research problem of interest, outline the main results of the thesis, and put the results in context with the wider subject area and its applications.

The main body of the text must be divided into a logical scheme which is followed consistently throughout the work. It usually starts with an introduction chapter and ends with a conclusion chapter. See, for example, the table of contents on page 3.

1.1 Some Basics About LaTeX

1.1.1 Equations

The main strength of \LaTeX mathematical typesetting.

There is a huge amount of information about LaTeX on the internet. A helpful short manual, also included in this folder, is the file `latex_intro.pdf`. This document gives a lot of sample LaTeX commands. The file `latex-howto.tex` in this folder also contains examples of many latex commands.

We first show some simple examples of mathematical formulae using latex typesetting.

1. The basic functions: $\cos(x), \sin(x), \ln(x)$, (`\cos (x) , \sin (x) , \ln (x)`).
2. Greek letters: $\alpha\beta\gamma\delta\epsilon\dots$ (`\alpha\beta\gamma\delta\epsilon\dots`).
3. Mathematical symbols: $\int \oint \sum \lim \bigcup \bigcap$ (`\int \oint \sum \lim \bigcup \bigcap`).
4. Fractions: $\frac{1}{2}, \frac{1}{2-x}$ (`\frac{1}{2} , \frac{1}{2-x}`).

The following matrix

$$\begin{bmatrix} U_r & r & W_r \\ 0 & 1 & V_x \\ 0 & 0 & W_x \end{bmatrix}, \quad (1.1)$$

is generated using the `equarray` environment:

```
\begin{equarray}\label{eqn:matrix}
\left[
\begin{array}{ccc}
U_{\mathrm{r}} & r & W_{\mathrm{r}} \\
0 & 1 & V_{\mathrm{x}} \\
0 & 0 & W_{\mathrm{x}}
\end{array}
\right],
\end{equarray}
```

The `\label{eqn:matrix}` command labels the equation with `{eqn:matrix}` which can be referred to somewhere else in the text by using `\ref{eqn:matrix}` or `\eqref{eqn:matrix}`.

The command `\notag` eliminates the numbering of the first equation,

$$\begin{aligned} \lambda^{(1)} &= \operatorname{tr}[T^{(1)}P], \\ \lambda^{(2)} &= \operatorname{tr}[T^{(2)}P - T^{(1)}ST^{(1)}P]. \end{aligned} \quad (1.2)$$

```
\begin{equarray} \label{eqn:lambda_trace}
\lambda^{(1)}=&\operatorname{tr}[T^{(1)}P], \notag \\
\lambda^{(2)}=&\operatorname{tr}[T^{(2)}P - T^{(1)}ST^{(1)}P].
\end{equarray}
```

1.1.2 Itemized lists

Example of an itemized list:

- muscle and fat cells remove glucose from the blood,
- cells use glucose for protein synthesis.

```
\begin{itemize}
\item muscle and fat cells remove glucose from the blood,
\item cells use glucose for protein synthesis.
\end{itemize}
```


This can be done by an enumerated list:

1. muscle and fat cells remove glucose from the blood,
2. cells use glucose for protein synthesis.

```
\begin{enumerate}  
\item muscle and fat cells remove glucose from the blood,  
\item cells use glucose for protein synthesis.  
\end{enumerate}
```

1.1.3 Inserting figures

You may save your Matlab figures as jpg files. Figures should be stored in the same folder as the latex files. For the graphicx package to work you usually need to ask latex to create a pdf file (e.g., command pdflatex or latexpdf).

An example of an inserted image is given in Figure 1.1.

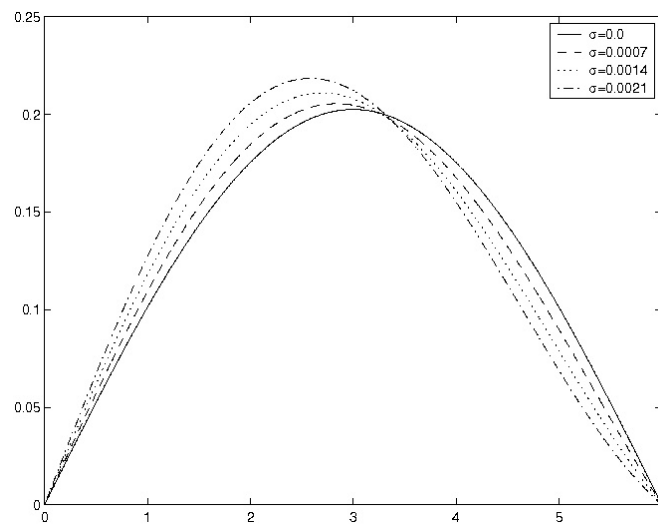


Figure 1.1: Mode shapes

1.1.4 Tables

Example of a table,

Gene	GeneID	Length
human latexin	1234	14.9 kbps
mouse latexin	2345	10.1 kbps
rat latexin	3456	9.6 kbps

Table 1.1: **title of table** - Overview of latexin genes.

```
\begin{table}[htdp]
\centering
```

```

\begin{tabular}{ccc}
% ccc means 3 columns, all centered; alternatives are l, r
{\bf Gene} & {\bf GeneID} & {\bf Length} \\
\hline % draws a line under the column headers
human latexin & 1234 & 14.9 kbps \\
mouse latexin & 2345 & 10.1 kbps \\
rat latexin & 3456 & 9.6 kbps \\
\end{tabular}
\caption[title of table]{\textbf{title of table} - Overview of latexin genes}
\label{latexin_genes} % label for cross-links with \ref{latexin_genes}
\end{table}

```

See how to add two vertical lines in the table (Simply change {ccc} to {c|c|c})

Gene	GeneID	Length
human latexin	1234	14.9 kbps
mouse latexin	2345	10.1 kbps
rat latexin	3456	9.6 kbps

Table 1.2: **title of table** - Overview of latexin genes.

1.1.5 How to Refer to Equations, Sections, etc

- References can be linked to equations, figures, tables or sections using the command `\ref`: Equation (1.2), Figure 1.1, Table 1.2 and Section 1.1.4.
`Equation~(\ref{eqn:lambda_trace}), Figure~\ref{modes},`
`Table~\ref{latexin_genes2} and Section~\ref{table}.`
- Equations can be conveniently referred to using `\eqref`. See, for example, Equation (1.2).
`Equation \eqref{eqn:lambda_trace}`
 Note that `\eqref` includes the round brackets by itself.
- Citations are in a similar way but using the command `\cite`:
`[2], [3], and [4], or [2–4] .`

```

\cite{Salmond}, \cite{Stull}, and \cite{TandC},
or \cite{Salmond,Stull,TandC} .

```

There are many different styles for writing citations – you should follow the norms for your subject are.

A more advanced way to do citations is to use `bibtex`. This is a powerful tool and we encourage you to try it. There is plenty of information about it on the web.

1.1.6 Theorem Environments

Definition 1.1.1 *This is not a very good definition.*

Lemma 1.1.2 *This is not a very good lemma.*

Theorem 1.1.3 *This is not a very good theorem.*

Proof: The proof goes in here. □

Example 1.1.4 *This is not a very good example.*

Corollary 1.1.5 *This is not a very good corollary.*

Proposition 1.1.1 *This is not a very good proposition. Note that this is numbered independently of the definition, lemmas, theorems, examples, corollaries etc. But it is numbered with respect to the section that it is in.*

Remark 1 *This is not a very good remark. Note that this is numbered independently of the definition, lemmas, theorems, examples, corollaries and even propositions. It is NOT numbered with respect to the section that it is in.*

Please note the numbering of the results.

The predefined commands for “the natural numbers” and “real numbers” look like \mathbb{N} and \mathbb{R} and the predefined commands for “cone” and “my norm” look like: $K[x; r] \|z\|$.

If you want a nice looking script you can use the `mathrsfs` fonts see, \mathscr{A} - script A . This was created using the predefined command “`ms`”.

Feel free to create your own commands.

Some colours that you can use are black, red, blue, cyan, magenta, yellow.

If you want even more colours then you can get orange fuchsia brown green violet turquoise purple to name but a few.

Chapter 2

Methodologies and analysis

2.1 Methodologies

2.2 Analysis

Chapter 3

Discussion

3.1 Main results

3.2 Discussion

Chapter 4

Conclusions

You may add more chapters as needed in the file.

References

- [1] Farge Marie, *Wavelet Transforms and Their Applications to Turbulence*, Ann. Rev. Fluid Mech. volume 24, pages 395-457, 1992.
- [2] Salmond Jennifer, *Vertical Mixing of Ozone in the Very Stable Nocturnal Boundary Layer*, PhD Thesis, University of British Columbia, 2001.
- [3] Stull B. Ronald, *Introduction to Boundary Layer Meteorology*, Dordrecht; Boston: Kluwer Academic Publishers, 1988.
- [4] Torrence Christopher, Compo Gilbert P., *A Practical Guide to Wavelet Analysis*, Bulletin of the American Meteorological Society volume 79, pages 61-78, 1998.

Appendix A

Some extra things

This is an optional chapter for any additional material that does not fit conveniently into the body of the text (e.g., data, copies of computer programmes). Note that appendices won't necessarily be marked.