

00-thesis-draft

00-THESIS-DRAFT

By You R. Name B.Sc.

*A Thesis Submitted to the School of Graduate Studies in the Partial Fulfillment  
of the Requirements for the Degree Doctor of Philosophy*

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*You may hate gravity, but gravity does not care*

—Albert Einstein



You can have a dedication here if you wish.



McMaster University  
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## **Lay Abstract**

The lay abstract must be 150 words or less.

It must explain the key goals and contributions of the thesis in lay terms that are accessible to the general public.



# Abstract

This is the abstract.

I can write a really long abstract.



## *Acknowledgements*

I want to thank a few people.

This includes my friends.



# Contents

<b>Abstract</b>	<b>iv</b>
<b>Acknowledgements</b>	<b>v</b>
<b>Declaration of Authorship</b>	<b>ix</b>
<b>Preface</b>	<b>1</b>
<b>1 R Markdown Basics</b>	<b>3</b>
<b>2 Writing</b>	<b>4</b>
<b>Conclusion</b>	<b>9</b>
<b>References</b>	<b>10</b>

# List of Figures



# List of Tables

# Declaration of Authorship

I, You R. Name, declare that this thesis titled, *00-thesis-draft* and the work presented in it are my own. I confirm that:

I did most of the research.

Also the writting.

Sometimes I cried.

But mostly I had fun.

# Preface

Welcome to the *R Markdown* thesis template. This template is based on (and in many places copied directly from) the Reed College LaTeX template, but hopefully it will provide a nicer interface for those that have never used TeX or LaTeX before. Using *R Markdown* will also allow you to easily keep track of your analyses in **R** chunks of code, with the resulting plots and output included as well. The hope is this *R Markdown* template gets you in the habit of doing reproducible research, which benefits you long-term as a researcher, but also will greatly help anyone that is trying to reproduce or build onto your results down the road.

Hopefully, you won't have much of a learning period to go through and you will reap the benefits of a nicely formatted thesis. The use of LaTeX in combination with *Markdown* is more consistent than the output of a word processor, much less prone to corruption or crashing, and the resulting file is smaller than a Word file. While you may have never had problems using Word in the past, your thesis is likely going to be about twice as large and complex as anything you've written before, taxing Word's capabilities. After working with *Markdown* and **R** together for a few weeks, we are confident this will be your reporting style of choice going forward.

## Why use it?

*R Markdown* creates a simple and straightforward way to interface with the beauty of LaTeX. Packages have been written in **R** to work directly with LaTeX to produce nicely formatting tables and paragraphs. In addition to creating a user friendly interface to LaTeX, *R Markdown* also allows you to read in your data, to analyze it and to visualize it using **R** functions, and also to provide the documentation and commentary on the results of your project. Further, it allows for **R** results to be passed inline to the commentary of your results. You'll see more on this later.

## Who should use it?

Anyone who needs to use data analysis, math, tables, a lot of figures, complex cross-references, or who just cares about the final appearance of their document should use *R Markdown*. Of particular use should be anyone in the sciences, but the user-friendly nature of *Markdown* and its ability to keep track of and easily include figures, automatically generate a table of contents, index, references, table of figures, etc. should make it of great benefit to nearly anyone writing a thesis project.

## For additional help with bookdown

---

Please visit [the free online bookdown reference guide](#).

```
if (!require("remotes"))
  install.packages("remotes",
                   repos = "https://cran.rstudio.org")
if (!require("bookdown"))
  install.packages("bookdown",
                   repos = "https://cran.rstudio.org")
```

Loading required package: bookdown

```
remotes::install_github("paezha/macdown")
```

Using GitHub PAT from the git credential store.

Skipping install of 'macdown' from a github remote, the SHA1 (4d47b0a2) has not changed  
Use 'force = TRUE' to force installation

# Chapter 1

## R Markdown Basics

Here is a brief introduction into using *R Markdown*. *Markdown* is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. *R Markdown* provides the flexibility of *Markdown* with the implementation of **R** input and output. For more details on using *R Markdown* see <https://rmarkdown.rstudio.com>.

Be careful with your spacing in *Markdown* documents. While whitespace largely is ignored, it does at times give *Markdown* signals as to how to proceed. As a habit, try to keep everything left aligned whenever possible, especially as you type a new paragraph. In other words, there is no need to indent basic text in the Rmd document (in fact, it might cause your text to do funny things if you do).

Here is a reference to Angel (2000).

## Chapter 2

# Writing

You can use R code in your document. For example:

```
'markdown'{r ch1-load-packages, message=FALSE} plot(cars)
```

Naming the code chunks is convenient for navigating your document. You can use chunk

Of course, unless you are explicitly illustrating/discussing the code, you might not

You can create elegant figures and tables using 'R' and displaying them in your thesi

Figure \ref{fig:ch1-scatterplot} is an example of a figure generated using the packag

```
\begin{figure}  
\includegraphics[width=0.8\linewidth]{thesis_files/figure-latex/ch1-scatterplot-1} \c  
\end{figure}
```

Table \ref{tab:summary-statistics} is an example of a table created using the package

```
\begin{table}  
  
\caption{\label{tab:ch1-table}\label{tab:summary-statistics}Example of a table with s  
\centering  
\begin{tabular}[t]{l1111}  
\toprule  
    & displ & year & cyl\\  
\midrule  
    & Min.   :1.600 & Min.   :1999 & Min.   :4.000\\  
    & 1st Qu.:2.400 & 1st Qu.:1999 & 1st Qu.:4.000\\
```

```
& Median :3.300 & Median :2004 & Median :6.000\\
& Mean   :3.472 & Mean   :2004 & Mean   :5.889\\
& 3rd Qu.:4.600 & 3rd Qu.:2008 & 3rd Qu.:8.000\\
\addlinespace
& Max.    :7.000 & Max.    :2008 & Max.    :8.000\\
\bottomrule
\end{tabular}
\end{table}
```

Table \ref{tab:summary-statistics-2} is the same as Table \ref{tab:summary-statistics-1}

<!-- To use landscape orientation start a new page with \newpage and begin the landscape

<!-- You can have one or multiple pages in landscape, and when you are ready to switch back to portrait

```
\newpage
\landscape
```

```
\begin{table}
```

```
\caption{\label{tab:ch1-table-2}\label{tab:summary-statistics-2}Example of a table in landscape
```

```
\centering
```

```
\begin{tabular}[t]{lrrrr}
```

```
\toprule
```

```
&      displ &      year &      cyl\\
```

```
\midrule
```

```
& Min.      :1.600 & Min.      :1999 & Min.      :4.000\\
```

```
& 1st Qu.:2.400 & 1st Qu.:1999 & 1st Qu.:4.000\\
```

```
& Median :3.300 & Median :2004 & Median :6.000\\
```

```
& Mean   :3.472 & Mean   :2004 & Mean   :5.889\\
```

```
& 3rd Qu.:4.600 & 3rd Qu.:2008 & 3rd Qu.:8.000\\
```

```
\addlinespace
```

```
& Max.      :7.000 & Max.      :2008 & Max.      :8.000\\
```

```
\bottomrule
```

```
\end{tabular}
```

```
\end{table}
```

```
\landscape
```

```
\newpage
```

```
<!--chapter:end:01-chap1.Rmd-->
```

```
# Mathematics and Science {#math-sci}
```

```
<!-- Required to number equations in HTML files -->
<script type="text/x-mathjax-config">
MathJax.Hub.Config({
  TeX: { equationNumbers: { autoNumber: "AMS" } }
});
</script>
```

## Math

\TeX\ is the best way to typeset mathematics. Donald Knuth designed \TeX\ when he got

If you are doing a thesis that will involve lots of math, you will want to read the f

```
<!-- MATH and PHYSICS majors: Uncomment the following section -->
```

```
$$
```

```
\sum_{j=1}^n (\delta\theta_j)^2 \leq \frac{\{\beta_i^2\}}{\{\delta_i^2 + \rho_i^2\}}
\left[ 2\rho_i^2 + \frac{\{\delta_i^2\beta_i^2\}}{\{\delta_i^2 + \rho_i^2\}} \right] \equiv \backslash
$$
```

From Informational Dynamics, we have the following (Dave Braden):

```
<!--
```

After  $n$  such encounters the posterior density for  $\theta$  is

```
$$
```

```
\pi(\theta|X_1<y_1,\dots,X_n<y_n) \propto \pi(\theta) \prod_{i=1}^n \int_{-\infty}^{\infty}
\exp\left(-\frac{(x-\theta)^2}{2\sigma^2}\right) dx
$$
```

Another equation:

```
$$
```

```
\det\left|\begin{matrix}
c_0&c_1&c_2&\dots&c_n\\
c_1&c_2&c_3&\dots&c_{n+1}\\
c_2&c_3&c_4&\dots&c_{n+2}\\
\vdots&\vdots&\vdots&\ddots&\vdots\\
c_n&c_{n+1}&c_{n+2}&\dots&c_{2n}
\end{matrix}\right|>0
$$
```



Lapidus and Pindar, Numerical Solution of Partial Differential Equations in Science and Engineering. Page 54

$$\int_t \left( \sum_{j=1}^3 T_j \left( \frac{d\phi_j}{dt} + k\phi_j \right) - kT_e \right) w_i(\mathbf{x}) \, dt \quad \text{for } i=1,2,3.$$

L&P Galerkin method weighting functions. Page 55

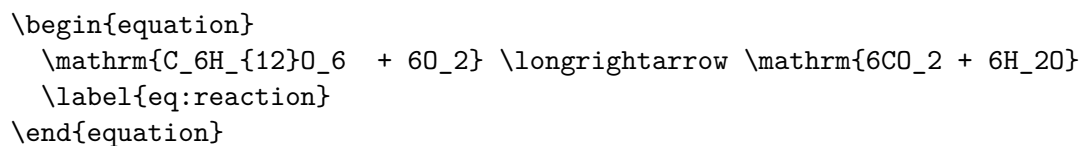
$$\sum_{j=1}^3 T_j \int_0^1 \left( \frac{d\phi_j}{dt} + k\phi_j \right) \phi_i \, dt = \int_0^1 k T_e \phi_i \, dt, \quad \text{for } i=1,2,3$$

Another L&P (p145)

$$\int_{-1}^1 \int_{-1}^1 \int_{-1}^1 f(\xi, \eta, \zeta) \, d\xi \, d\eta \, d\zeta = \sum_{k=1}^n \sum_{j=1}^n \sum_{i=1}^n w_i w_j w_k f(\xi_i, \eta_j, \zeta_k).$$

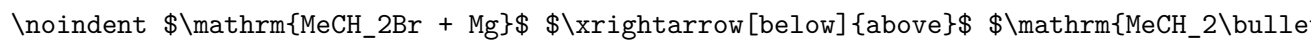
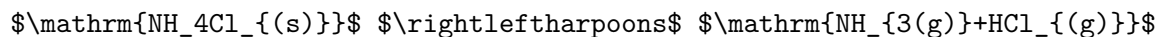
Another L&P (p126)

$$\int_{A_e} (\mathbf{v} \cdot \mathbf{n}) \, dA = \int_{-1}^1 \int_{-1}^1 (\mathbf{v} \cdot \mathbf{n}) \, \det[\mathbf{J}] \, d\xi \, d\eta$$



We can reference this combustion of glucose reaction via Equation [\eqref{eq:reaction}](#)

### Other examples of reactions



-->

## Physics

Many of the symbols you will need can be found on the math page <<https://web.reed.edu>>

## Biology

You will probably find the resources at <<https://www.lecb.ncifcrf.gov/~toms/latex.htm>>

<!--chapter:end:02-chap2.Rmd-->

---

title: "02-methods"  
output: pdf\_document  
date: "2025-04-05"  
---

```
``` r  
library(knitr)  
library(markdown)  
print("this is a test file")
```

```
[1] "this is a test file"
```

# Conclusion

If we don't want Conclusion to have a chapter number next to it, we can add the `{-}` attribute.

## **More info**

And here's some other random info: the first paragraph after a chapter title or section head *shouldn't be* indented, because indents are to tell the reader that you're starting a new paragraph. Since that's obvious after a chapter or section title, proper typesetting doesn't add an indent there.

# References

- Angel, E. (2000). *Interactive computer graphics : A top-down approach with OpenGL*. Boston, MA: Addison Wesley Longman.
- Angel, E. (2001a). *Batch-file computer graphics : A bottom-up approach with QuickTime*. Boston, MA: Wesley Addison Longman.
- Angel, E. (2001b). *Test second book by angel*. Boston, MA: Wesley Addison Longman.