University of the Philippines Cebu

MATHEMATICAL MODELS IN LITERATURE

BY

Juan L. Dela Cruz, Jr.

A special problem submitted to the
College of Science
University of the Philippines Cebu
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Mathematical Models in Literature
by Juan L. Dela Cruz, Jr.
Special Problem, Bachelor of Science in Mathematics
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Classification*: P
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Available to the general public	Yes
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Juan L. Dela Cruz, Jr.
Student

Daniel Smith
Thesis Adviser

University of the Philippines Cebu

This is to certify that this Special Problem entitled **"Mathematical Models in Literature"**, prepared and submitted by **Juan L. Dela Cruz, Jr.** to fulfill part of the requirements for the degree of **Bachelor of Science in Mathematics**, was successfully defended and approved on June 08, 2023.

Daniel Smith
Thesis Adviser

Charles Johnson
Thesis Panel

The College of Science endorses the acceptance of this Special Problem as partial fulfillment of the requirements for the degree of Bachelor of Science in Mathematics.

Nelia S. Ereno
Dean
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Acknowledgments

Type your acknowledgements here. It is customary to acknowledge special assistance from extramural agencies. There is no obligation that assistance received from members of the dissertation or thesis committee be acknowledged.

Acknowledgments should be couched in terms consistent with the scholarly nature of the work. Your name and the date should not appear on this page.

Abstract

Mathematical Models in Literature

Juan L. Dela Cruz Jr.
University of the Philippines Cebu, 2023

Adviser:
Daniel Smith

Type your abstract here. Your abstract should have a minimum of 150 words and a maximum of 300 words.

List of Tables

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Chapter 1

How to Write Text and Type Equations

Write text the way you usually write your documents. Separate paragraphs using the

command. Leave an extra space before you write the next paragraph.

To write an equation like $x^2 - 2x + 6 - 8$ within the text, use

```
$x^2 - 2x +6 - 8$
```

In some cases, like writing equations with the summation, integral or limit symbols, include in the equation the \ displaystyle command. For example,

```
This is what happens:
$\displaystyle \sum_{n=0}^\infty \frac{x^n}{n!}$.
```

gives the following result:

This is what happens: $\displaystyle \sum_{n=0}^\infty \frac{x^n}{n!}$.

This is how you write an equation on a different line.

$$f_x + f_{xyy} + \sum_{k=0}^\infty \sqrt{4} + \frac{5}{6}$$

$$\sum_{n=0}^{+\infty} \frac{f^{(n)}(a)}{n!} (x-a)^n$$

```
$$ {f_x} + {f_{xyy}} + \sum_{k=0}^\infty \sqrt{4} + \frac{5}{6} $$
$$ \sum_{n=0}^{+\infty} \frac{f^{(n)}(a)}{n!} (x-a)^n $$
```

$$\begin{aligned} f(x) &= \sum_{n=0}^{+\infty} \frac{f^{(n)}(a)}{n!}(x-a)^n \\ &= f(a) + \frac{f'(a)}{1!}(x-a) + \frac{f''(a)}{2!}(x-a)^2 + \dots \end{aligned}$$

```
\begin{eqnarray*}
f(x)  &=&  \sum_{n=0}^{+\infty} \frac{f^{(n)}(a)}{n!} (x-a)^n\\
&=& f(a) + \frac{f'(a)}{1!}(x-a) + \frac{f''(a)}{2!}(x-a)^2+ \ldots
\end{eqnarray*}
```

Separate paragraphs by using `\medskip`, then one more vertical space. You may also use bigskip or smallskip.

This is how you number an equation:

```
\begin{equation}
\int_{-\infty}^\infty e^{x^2/2} dx \label{myequation}
\end{equation}
```

$$\int_{-\infty}^{\infty} e^{x^2/2} dx \tag{1.1}$$

Now, we can reference the equation above using the code: `(\ref{myequation})`. Using this we get equation (1.1).

To work on a theorem environment, you type:

```
\begin{theorem}\label{thm:main}
[Main Theorem] The following is a theorem.
\end{theorem}
```

to get something like this:

Theorem 1.1 *[Main Theorem] The following is a theorem.*

You may replace 'theorem' by 'definition', 'lemma' or 'proposition', or even 'proof':

Proof. This is the proof of Theorem 1.1. □

Chapter 2

How to Compile and Print

If you are using TeXnicCenter, the documents are all linked to a project. This makes the compiling easier. Open the files using "Open project". To compile use F7 or Build output. This will compile to a readable format, depending on which output file you're using (DVI,PS,PDF).

If you are in command line mode or using linux, use the command `latex main`. This command produces the file called `main.dvi`, and to view the dvi file, use the command `xdvi main`.

Print your file using the output file you are using.

Chapter 3

How to include JPEGs and Tables

In this Chapter, you will learn how to include figures in JPEG. In the example below, the jpeg file has to be in the same directory as your tex files. The code is:

```
\begin{figure}[ht]
\begin{center}
\includegraphics[width=6cm,height=4cm]{deriv1.jpg}
\end{center}\caption{Secant lines forming the tangent line.}
\label{fig:deriv1}
\end{figure}
```

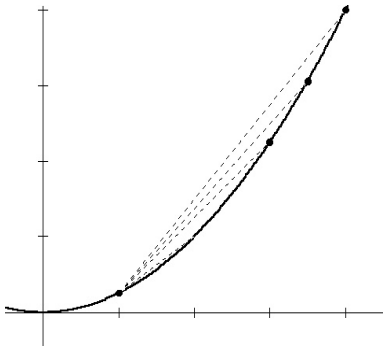

Figure 3.1: Secant lines forming the tangent line.

The figure above is referenced using the `ref` command: Figure 3.1.

It is recommended that you prefix all figure labels by `fig:`, all chapter labels by `sec:`, and all table labels by `tab:`.

For tables, the codes are as follows:

```
\begin{table}[h]
\begin{center}
\begin{tabular}{|l|ll|}
\hline name &  age& sex \\
\hline John & 32 & male \\
       Diwata & 18 & male \\ \hline
\end{tabular}
\end{center}
\caption{This is how you caption tables.}\label{tab:table1}
\end{table}
```

Table 3.1 below illustrates the created table.

name	age	sex
John	32	male
Diwata	18	male

Table 3.1: This is how you caption tables

Chapter 4

How to Cite References

First edit the file `bibliog.bib` by adding an entry for each reference used in your thesis. Follow the format in the sample file.

```
@BOOK{bsw,
  author={H. T. Banks and R. C. Smith and Y. Wang},
  title={Smart Material Structures: Modeling Estimation
         and Control},
  year=1996,
  publisher={Masson/John Wiley},
  address={Paris/Chichester}
}

@ARTICLE{BanksIto1,
  author={H. T. Banks and K. Ito},
  year=1997,
  title={Approximation in {LQR} Problems for Infinite Dimensional
    Systems with Unbounded Input Operators},
  journal={Journal of Mathematical Systems, Estimation, and Control},
  volume=7,
  pages={1-34},
  publisher={Birkh\"{a}user Boston}
}

@PHDTHESIS{Ric,
  author = {R. C. H. del Rosario },
  year = 1998,
```

```
  title = {Computational Methods for Feedback Control in
        Structural Systems},
  school = {N. C. State University}
}

@techreport{RalphRic3a,
  author = {R. C. H. del Rosario and R. C. Smith},
  year = 1997,
  title = {{LQR} Control of Thin Shell Dynamics: Formulation and
           Numerical Implementation},
  institution = {Institute for Computer Applications in Science
    and Engineering},
  number={ICASE Report 97-59},
  address={NASA Langley Research Center, Hampton},
}

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%   %MISC   %%%%%%%%%%%%%%%%%%%%%%%%%%%

@BOOKLET{Le,
  author={A. W. Leissa},
  title={Vibrations of Shells},
  year=1973,
  publisher={NASA SP-288},
  howpublished={Reprinted by the Acoustical Society of America
   through the American Institute of Physics}
}

@manual{d31ref,
  organization = {{Institute} of Electrical and
   Electronics Engineers},
  year = 1978,
```

```
  title = {IEEE Standard on Piezoelectricity},
  address={New York}
}

@manual{pside,
  title = {Specification of PSIDE},
  author={Jacques J.B. de Swart and Walter M. Lioen and
   Wolter A. van der Veen},
  year=1998,
  note={Avalable at http://www.cwi.nl/cwi/projects/PSIDE/}
}
```

Click from the BibTex icon (if you are using WinEdit Program) or use the BibTex command if you are in command line mode. It is suggested that you do this twice. Then compile the main tex file using the LaTeX command.

Use the `cite` command to cite a reference. For example, `\cite{bsw}` cites the book labeled "bsw". This will give us [3].

List of References

[1] H. T. Banks and K. Ito, *Approximation in LQR problems for infinite dimensional systems with unbounded input operators*, Journal of Mathematical Systems, Estimation, and Control, 7 (1997), pp. 1–34.

[2] H. T. Banks, R. C. Smith, and Y. Wang, *Smart Material Structures: Modeling Estimation and Analysis*, Masson/John Wiley, Paris/Chichester, 1996.

[3] ——, *Smart Material Structures: Modeling Estimation and Control*, Masson/John Wiley, Paris/Chichester, 1996.

[4] J. J. de Swart, W. M. Lioen, and W. A. van der Veen, *Specification of PSIDE*, 1998. Avalable at http://www.cwi.nl/cwi/projects/PSIDE/.

[5] R. C. H. del Rosario, *Computational Methods for Feedback Control in Structural Systems*, PhD thesis, N. C. State University, 1998.

[6] R. C. H. del Rosario and R. C. Smith, *LQR control of thin shell dynamics: Formulation and numerical implementation*, Tech. Report ICASE Report 97-59, Institute for Computer Applications in Science and Engineering, NASA Langley Research Center, Hampton, 1997.

[7] Institute of Electrical and Electronics Engineers, *IEEE Standard on Piezoelectricity*, New York, 1978.

[8] A. W. Leissa, *Vibrations of shells*. Reprinted by the Acoustical Society of America through the American Institute of Physics, 1973.