A Quick Introduction to LaTeX 2ε

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Thank You!

Many of the materials, ideas, and structures in this introduction come from the English version of **The Not So Short Introduction to LaTeX 2ε** by Tobias Oetiker.

Some of the material also come from Dr. Ross Ihaka's notes for STATS 782 – Computing for Statisticians.

I would also like to thank Andrew Lavery of the **Student Learning Centre** at the University of Auckland, for reviewing this document and providing suggestions, as well as correcting my grammar.

Finally, as this is still an evolving document, I would really appreciate it if you can give me some constructive feedback, to help me improve this document. Any comments and feedback can be directed to `k.wang@auckland.ac.nz`.

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Chapter 1

Introduction

It is assumed that, if you are reading this, you probably don't have a lot of experience with LaTeX, or probably have never even heard of it until today. If you have been using LaTeX for quite a while, then this document is not suitable for you.

In this document, I will try my best to write in an intuitive way. It is assumed that you have had at least some experience with a GUI Word Processing software, such as Microsoft Word before.

Most people, myself included, will hate LaTeX when they first start learning it. Compared with Microsoft Word (or equivalent), LaTeX is extremely difficult to pick up. However, once you become used to its syntax, you will love it. When I first met LaTeX, I found it was very difficult to use it, and tried to use Microsoft Word to avoid LaTeX. But now, I rarely use Word, and always use LaTeX to do my work.

In this document, I will only give a very brief introduction to LaTeX typesetting. More resources can be obtained for free on the Internet, and I have a list of these resources in Chapter 7.

Now, let's begin by look at the history of LaTeX.

1.1 A long long time ago...

Back in the dark ages in the pre-PC time, typsetting a scientific document was extremely difficult. Then, in 1977, the infamous mathematician/computer scientist, Donald E. Knuth, started writing a TeX typsetting engine, which was targetted primarily at producing good-quality mathematical formulae.

TeX reached its maturity in 1982, and in 1989 some slight enhancement was made to support multiple languages. It is renowned for its extreme stability and portability.

The version is converging to π and is now 3.14159. TeX is pronounced as *Tech*, not *Tax*, and is written as `TeX` in an ASCII environment.

1.2 From TEX to LATEX

One of the reasons Don Knuth is famous, is that not many people understand his work. When he first released TEX and the accompanying documentation, he was probably the only person who could actually use it well enough to write a book with the software.

A few years later, people started to understand his work, and Leslie Lamport went on to write LATEX on top of the TEX engine. Since then, it has become widely used in the science community, and is famous for its stability, portability, and quality. In fact, in terms of mathematical formulae, it is unsurpassed in its typographical quality.

LATEX is pronounced as *Lay-Tech* or *Lah-Tech*, not *lay-tax*. In an ASCII world, it is written as `LaTeX`.

1.3 To LATEX or not to LATEX

If you are sure that you will never need to typeset long document, publish a book in the scientific community, typeset mathematical formulae or equations, then you probably don't need to learn LATEX. You will be happier to keep working in Word.

Microsoft Word, undeniably, has its advantages. For one thing, it is the most commonly used typesetting tool. It is also easier to produce tables (provided the tables are not so long that they stretch to several pages). It is also easier to pick up, and can include many different picture formats without *too much* trouble.

On the other hand, if you ever need to typeset mathematics, write long documents (e.g. a thesis), and you only care about the aesthetics, then you should consider using LATEX. For one thing, LATEX itself and all its editors (except WinEdt) are free. It also does most of the professional layout and typesetting for you. It has excellent math and formulae support, and handles bibliography, index and cross referencing with ease. Also, since LATEX documents are in plain ASCII format (at least before you compile it into other formats), it is very small to transfer via the Internet, and you can easily FTP your LATEX document between workplace and home. Best of all, it is available on virtually all kind of operating systems, and you can produce PDF documents directly from LATEX documents without buying commercial software such as Adobe Acrobat.

In the next chapter, we will look at how to get LATEX set up and running under a Windows environment.

Chapter 2

Obtaining, Installing, and Running

Most of the materials in this chapter are directly quoted from Dr. Claus Dethlefsen's web page **LaTeX, Emacs etc. for your PC** (http://www.math.auc.dk/~dethlef/Tips/introduction.html).

Please also note that throughout this document, I will assume you are using (X)Emacs to edit your LaTeX document. (X)Emacs is considered not just a text editor, but a *legend*.

2.1 Preparation

Before you do anything else, you need to make sure your computer meets the following requirements in Section 2.1.1.

When you finish setting up your enviroments, run a test. Open a DOS-prompt window, by going to `Start -> Run... -> cmd`. Then type `set`.

2.1.1 System Requirements

- A PC with a 486 processor or better
- Windows 95/98, Windows NT 4.0, Windows 2000 or Windows XP (you need administrator privileges to install MikTeX).
- Plenty of space on your hard-drive (at least 200Mb)
- Network connection allowing you to download approx. 45Mb

The last requirement is optional if you choose to install the software provided on the CD.

2.1.2 Software Requirements

- A (un)zip utility, such as WinZip on this CD (the latest version is also available from www.winzip.com.
- Acrobat Reader from www.adobe.com if you plan to use the PDF facilities.
- Previous versions of Emacs, Miktex, GSview, Ghostscript should be removed before installation.

2.1.3 Environment

Before you proceed, create a directory called `C:\temp` and another called `C:\tmp`.

You will also need to set up your enviornment in Windows. Depending on your versions:

Windows 9x

Open your `C:\autoexec.bat` in a notepad equivalent programme, and type in the following if they are not there already:

```
set TEMP=C:\TEMP
set TMP =C:\TEMP
set HOME=C:\
set DICTDIR=C:\usr\local\lib
set PATH=%PATH%;c:\usr\local\bin;
set PATH=%PATH%;c:\program files\emacs\bin;
set PATH=%PATH%;c:\program files\ghostgum\ghostview\gsview\;
```

Then restart your computer.

Note that some systems do not like long filenames, so you might want to use:

```
set PATH=%PATH%;c:\progra~1\emacs\bin;
set PATH=%PATH%;c:\progra~1\ghostgum\ghostview\gsview\;
```

Windows NT/2000/XP

- Right-click on the My Computer icon and choose **Properties**. (For Win2000, click the 'Advanced' tab). Select the **Environment** tab.
- Create a User Variable called Path with the following value in one line (here I have broken the line):

```
c:\program files\emacs\bin;
c:\program files\ghostgum\ghostview\gsview\;c:\usr\local\bin;
```

If the Path variable exists, append the above to it.

- Create a **User Variable** called HOME with value `c:\`
- Create a **User Variable** called DICTDIR with value `c:\usr\local\lib`
- Create a **User Variable** called TMP with value `c:\temp` (if it is not there already).
- Create a **User Variable** called TEMP with value `c:\temp` (if it is not there already).
- Restart the computer.

2.2 Download

If you are reading this document on the CD, then you do not need to worry about downloading the following software. You will find the following in the CD:

- Adobe Reader 6.0
- AucTeX 11.13
- Emacs 21.3
- ESS 5.1.24
- GhostScript 8.13
- GSView 4.6
- Ispell 3.2.06
- MikTeX 2.4
- TeXPoint 2.0.3
- The Gimp! 1.2.5

If you do not have a copy of the CD, the easiest way to obtain all the software is to go to Dr. Claus Dethlefsen's web site at http://www.math.auc.dk/~dethlef/Tips/download.html. He has a list of the URLs where you can get them. If you need to do this, please follow the installation guide from his web site.

2.3 Installation

Follow these steps to get a working emacs/latex environment. Choose any drive and directories for installation (but you may have to change the environment variables). I will assume that you install according to the following:

```
Emacs       ->    c:\program files\emacs
Miktex      ->    c:\program files\texmf
localtexmf  ->    c:\localtexmf (local TEXMF tree)
Ghostscript ->    c:\program files\ghostgum\gs
Ghostview   ->    c:\program files\ghostgum\ghostview
Auctex      ->    c:\program files\emacs\site-lisp\auctex
ispell      ->    c:\usr\local\bin     (This CANNOT be changed)
.emacs      ->    c:\.emacs            (the value of HOME)
```

2.3.1 Emacs 21.3

- Unzip the emacs-21.3.zip file to `C:\program files\` (1876 files)
- Rename the `C:\program files\emacs-21.3` directory to `C:\program files\emacs`
- Run the file `C:\program files\emacs\bin\addpm.exe`

To test, open the `Start Menu/Programs/Gnu Emacs/Emacs`. Emacs should start up.

2.3.2 AucTeX 11.13

- Unzip auctex-11.13.zip to `C:\program files\emacs\site-lisp`
- Rename `C:\program files\emacs\site-lisp\auctex-11.13` to `C:\program files\emacs\site-lisp\auctex`
- Unzip startup1.zip to `C:\` (the value of your HOME variable). This creates the startup file `C:\.emacs`. You must edit this file, if you install auctex to a different place.

To test, (Re)Start Emacs. In emacs, call `M-x latex-mode`[1]. You should see the `Command` and `LaTeX` menus. Also the `Ref` menu is shown (RefTeX is also activated).

[1] Note that `M-` denotes the `Alt` button on your keyboard.

2.3.3 Ispell 3.2.06

- Unzip ispell-3.2.06.zip to `C:\` (the directory cannot be changed) (22 files)
- Put cygwin1.dll into `C:\usr\local\bin`

To test, at a Command prompt, type `ispell`. Please note that `C:\tmp` must exist and that the `DICTDIR` variable should be defined, for more information please refer to Section 2.1.3.

2.3.4 GhostScript 8.13

- Run GhostScript 8.13.exe
- Choose `C:\program files\ghostgum\gs` as installation directory
- Accept everything else

2.3.5 GhostView 4.6

- Run GSView 4.6.exe
- Choose `C:\program files\ghostgum\ghostview` as installation directory
- Accept everything else

2.3.6 MikTEX 2.4

Read **install.pdf** in the MiKTEX directory and, if needed download MiKTEX.

If you are to install MiKTEX from this CD, and are having trouble doing so, you may need to move EVERYTHING under `\MiKTeX` into `C:\Temp`.

It is a good idea to run the MiKTEX Update Wizard at least once a month to get the latest packages. To run this, go to `Start -> MiKTeX -> MiKTeX Update Wizard`.

2.3.7 Lacheck 1.20

This is optional, but useful for beginners. LaCheck is a *consistency checker* which reads a LATEX document and display warnings, if it finds a bad sequence or references.

Move lacheck.exe to `C:\program files\texmf\miktex\bin`

To test, at a DOS prompt, run `lacheck foo.tex`, where `foo.tex` is a LATEX file. It should spit out some suggestions. In Emacs in `latex-mode`, choose the `Check` command from the Command menu.

2.4 Testing

If you want to get ESS or other plugins running with Emacs, please refer to Dr. Dethlefsen's web page at http://www.math.auc.dk/~dethlef/Tips/tuning.html.

2.5 Test

- Some versions of Miktex contains `C:\program files\texmf\doc\guides\lshort-english\src`. If you have this directory, open the file `lshort.tex` in Emacs and jump to `Press C-c C-c` below. Else, proceed.
- If it does not exist, create the directory `C:\localtexmf\tex\latex`
- Unzip lshort-3.20.zip to `C:\localtexmf\tex\latex` (See the download page for the CTAN location of this file)
- Open Emacs and choose Files/Open file and get the file `C:\localtexmf\tex\latex\lshort-3.20\src\lshort.tex`
- Press `C-c C-c <Return>`[2] to run latex
- Press `C-c C-l` to view results of the compilation
- Press `C-c C-c <Return>` to run latex again
- Press `C-c C-c <Return>` to run latex again, again
- Press `C-c C-c <Return>` to run View
- Press `C-c C-c FILE <Return> <Return>` to run dvips (Note that the command is FILE and not Dvips as one might expect)
- Press `C-c C-c Print <Return> <Return>` to run GSview (Also somewhat misleading name)
- If you want to print the document, do so from GSview

2.6 Other Plugins

If you want to get other plugins to work with Emacs, please go to http://www.math.auc.dk/~dethlef/Tips/tuning.html.

If you want to use ESS in Emacs with R, please refer to my web site at http://www.stat.auckland.ac.nz/~kwan022/rinfo.php.

[2] A `C-` in Emacs means the `Ctrl` key on your keyboard.

2.7 AucTEX References

This section is originally written by Dr. Ross Ihaka from the Department of Statistics. I put it here for completeness. You will need to know at least some of the shortcut keys in AucTEX to make your life easier.

Emacs commands are accompanied either by simultaneously holding down the *Control* key (indicated by `C-`) or the *Alt* key (indicated by `M-`).

Entering LaTeX Mode

`M-x latex`	enables LaTeX mode

Environments and Sections

`C-c C-e`	insert a `\begin{}` ... `\end{}` environment
`C-u C-c C-e`	change enclosing environment type
`C-c ]`	close current environment
`M-RET`	insert `\item` for list environment
`C-c C-s`	insert section (prompt for section type)

Font Changes

`C-c C-f C-r`	insert roman `\textrm{}` text
`C-c C-f C-b`	insert **bold** `\textbf{}` text
`C-c C-f C-i`	insert *italic* `\textit{}` text
`C-c C-f C-e`	insert *emphasized* `\emph{}` text
`C-c C-f C-s`	insert *slanted* `\textsl{}` text
`C-c C-f C-f`	insert sans serif `\textsf{}` text
`C-c C-f C-t`	insert `typewriter` `\texttt{}` text
`C-c C-f C-c`	insert Small Caps `\textsc{}` text
`C-c C-f C-d`	delete the innermost font specification containing the point

Commenting and Uncommenting Regions

`C-c ;`	comment out selected region
`C-c :`	uncomment selected region

Quotes, Dollars and Braces

`"`	*electric* quotes (inserts “ or ”)
`""`	inserts a literal "
`$`	inserts a $ (shows matching $)
`C-c {`	inserts a matching (and empty) `{}` pair

Chapter 3

Basic Document Preparation

I will only briefly talk about the LaTeX structure and syntax in this section. A more comprehensive document called The Not So Short Introduction to LaTeX 2_ε is available, and you will have a copy of this if you have followed the instructions in Chapter 2.5.

3.1 Basic Template

A LaTeX document always has the basic structure:

```
\documentclass[options]{format}
\begin{document}
...
\end{document}
```

Most commonly, the *format* specification is article, though you will often encounter report, and book[1]. The *options* specification consists of a list of options separated by commas, most commonly are a4paper to set the size of paper to be A4, or 11pt to set font size to be 11 points (default being 10pt).

If you have been using, say, Java, then you will be aware that at the beginning of your Java programme you may have a line like:

```
import java.util.*;
```

which says you wish to use the classes in the `java.util` package in your application.

In LaTeX, there are many *packages*. In order to use the features in a certain package, you must load it in your preamble. A **preamble** area is the region between the `\documentclass` and `\begin{document}`. To load a package you will need:

```
\usepackage{package-name}
```

[1] The format I used for this documentation

For example, `\usepackage{url}` will allow you to use the url package. I have used this package to make the hyperlinks of this document. For example, in your LaTeX document, provided you have loaded the `url` package in your preamble region, you can do something like `\url{www.auckland.ac.nz}` which will create a hyperlink in your DVI or PDF file.

Sometimes I find it easier to compile my documents in the DOS-prompt window. Say you have created a `foo.tex` file in `C:\Temp` directory, then you can do the following in DOS-prompt

```
cd C:\Temp
latex foo
```

to get your DVI file. To get the PostScript file:

```
dvips -f foo.dvi > foo.ps
```

to get a PDF file (provided your document does not have any pictures in PS or EPS format):

```
pdflatex foo
```

3.2 Fonts Type

LaTeX Markup	Results
plain roman text	`\textrm{}`
boldface text	`\textbf{}`
italic text	`\textit{}`
slanted text	`\textsl{}`
Small Capitals	`\textsc{}`
sans serif text	`\textsf{}`
`typewriter text`	`\texttt{}`

The font declarations can be nested, for example:

```
\texit{\textbf{University of Auckland}}
```

will produce ***University of Auckland***.

3.3 Environments

3.3.1 `itemize`

To produce item-lists:

```
\begin{itemize}
\item Department of Statistics
\item Department of Mathematics
\item Department of Computer Science
\end{itemize}
```

will produce:

- Department of Statistics
- Department of Mathematics
- Department of Computer Science

3.3.2 `enumerate`

You can also produce numbered-lists:

```
\begin{enumerate}
\item Department of Statistics
\item Department of Mathematics
\item Department of Computer Science
\end{enumerate}
```

will produce:

1. Department of Statistics
2. Department of Mathematics
3. Department of Computer Science

Both itemize and enumerate can be nested.

3.3.3 `table`

To produce tables:

```
\begin{table}[h]
  \centering
  \begin{tabular}{ll}
    \textbf{\latex Markup} & \textbf{Results} \\[3mm]
    \textrm{plain roman text} & \verb@\textrm{}@ \\
    \textbf{boldface text}    & \verb@\textbf{}@ \\
    \textit{italic text}      & \verb@\textit{}@ \\
    \textsl{slanted text}     & \verb@\textsl{}@ \\
    \textsc{Small Capitals}   & \verb@\textsc{}@ \\
    \textsf{sans serif text}  & \verb@\textsf{}@ \\
    \texttt{typewriter text}  & \verb@\texttt{}@ \\
  \end{tabular}
\end{table}
```

which will produce the font declaration table shown in 3.2.

3.3.4 `verbatim`

You may find taht you need to put in a block of computer output or program code. The verbatim environment provides a way of doing this. All characters in the environment will be treated literally (i.e. as plain ASCII text, rather than LaTeX special markups), and presented in `typewriter font`.

For example, I used the `verbatim` environment to enclose the LaTeX markups for item-lists, numbered-lists, and table in the previous sections.

3.4 Exercise

1. Typeset a 500-word document that tells people your degree, major, research interests, where you were born and if not born in NZ, when you came to NZ. You must use at least 2 different font types, and either an `itemize` or an `enumerate` environment, you should also have several paragraphs (i.e. do not put everything in one paragraph).

2. Below is a table that shows the percentage of votes each party received and the corresponding seats in the parliament, in the 2002 New Zealand General Election. Typeset the table into the document you have created above[2].

Party	**Votes**	**Seats**
Labour	41.26	52
National	20.93	27
NZ First	10.38	13
Act	7.14	9
Green	7.00	9
United Future	6.69	8
Progressive Coalition	1.70	2

Table 3.1: 2002 General Election Results

[2]Source: http://www.electionresults.govt.nz/partystatus.html

Chapter 4

Basic Mathematics

Typesetting mathematics in LaTeX may be somewhat non-trivial for beginners, but it allows one to produce mathematics to the highest typographical quality and create extremely complicated mathematical formulaes.

It is strongly recommended that you have:

```
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
```

in your preamble region. These three packages allow you to use the features provided by the AMS (Americian Mathematical Society).

4.1 Equations

Mathematics in LaTeX can be displayed in two ways:

- Inline mathematics/equations
- Displayed equations

Inline mathematics/equations are **within** a paragraph, for example $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$. They are enclosed by two dollar signs, i.e. `$\sum^{n}_{i =1}{i} = \frac{n(n + 1)}{2}$`. It is not a good idea to type a complicated equation as inline mathematics.

Displayed equations are:

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

and is enclosed by:

```
\[
\sum^{n}_{i =1}{i} = \frac{n(n + 1)}{2}
\]
```

or

```
\begin{displaymath}
\sum^{n}_{i =1}{i} = \frac{n(n + 1)}{2}
\end{displaymath}
```

4.2 Matrices

Say we have an $n \times p$ matrix:

$$\mathbf{X} = \begin{bmatrix} x_{11} & \cdots & x_{1p} \\ \vdots & \ddots & \vdots \\ x_{n1} & \cdots & x_{np} \end{bmatrix}$$

It is typesetted with:

```
\[
\mathbf{X} = \left[
  \begin{array}{ccc}
    x_{11} & \cdots & x_{1p} \\
    \vdots & \ddots & \vdots \\
    x_{n1} & \cdots & x_{np}
  \end{array}
  \right]
\]
```

4.3 Aligned Equations

Say we have:

$$\begin{aligned} (a+b)^2 &= (a+b)(a+b) \\ &= a^2 + ab + ab + b^2 \\ &= a^2 + 2ab + b^2 \end{aligned} \tag{4.1}$$

It is typesetted by:

```
\begin{eqnarray}
  \label{eq:complete}
  (a + b)^2 & = & (a + b)(a + b) \nonumber\\
            & = & a^2 + ab + ab + b^2 \nonumber\\
            & = & a^2 + 2ab + b^2
\end{eqnarray}
```

If you use `eqnarray*` instead of `eqnarray` then all the numbering of equations will be disabled. One rule of thumb is that if you will not refer back to your equation anywhere in your document, that is if you won't have something like **Equation 4.1 shows...**, then do not number you equations.

4.4 List of Mathematical Symbols

You will find that all symbols in the following tables are accessible from the AMS Math mode[1] .

Table 4.1: Math Mode Accents.

$\hat{a}$	`\hat{a}`	$\check{a}$	`\check{a}`	$\tilde{a}$	`\tilde{a}`	$\acute{a}$	`\acute{a}`
$\grave{a}$	`\grave{a}`	$\dot{a}$	`\dot{a}`	$\ddot{a}$	`\ddot{a}`	$\breve{a}$	`\breve{a}`
$\bar{a}$	`\bar{a}`	$\vec{a}$	`\vec{a}`	$\widehat{A}$	`\widehat{A}`	$\widetilde{A}$	`\widetilde{A}`

Table 4.2: Lowercase Greek Letters.

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

Table 4.3: Uppercase Greek Letters.

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

[1] This section is directly extracted out from **The Not So Short Introduction to LaTeX 2ε by Tobias Oetiker**

Table 4.4: Binary Relations.

You can produce corresponding negations by adding a `\not` command as prefix to the following symbols.

$<$	`<`	$>$	`>`	$=$	`=`
$\leq$	`\leq` or `\le`	$\geq$	`\geq` or `\ge`	$\equiv$	`\equiv`
$\ll$	`\ll`	$\gg$	`\gg`	$\doteq$	`\doteq`
$\prec$	`\prec`	$\succ$	`\succ`	$\sim$	`\sim`
$\preceq$	`\preceq`	$\succeq$	`\succeq`	$\simeq$	`\simeq`
$\subset$	`\subset`	$\supset$	`\supset`	$\approx$	`\approx`
$\subseteq$	`\subseteq`	$\supseteq$	`\supseteq`	$\cong$	`\cong`
$\sqsubset$ [a]	`\sqsubset` [a]	$\sqsupset$ [a]	`\sqsupset` [a]	$\bowtie$ [a]	`\Join` [a]
$\sqsubseteq$	`\sqsubseteq`	$\sqsupseteq$	`\sqsupseteq`	$\bowtie$	`\bowtie`
$\in$	`\in`	$\ni$	`\ni` , `\owns`	$\propto$	`\propto`
$\vdash$	`\vdash`	$\dashv$	`\dashv`	$\models$	`\models`
$\mid$	`\mid`	$\parallel$	`\parallel`	$\perp$	`\perp`
$\smile$	`\smile`	$\frown$	`\frown`	$\asymp$	`\asymp`
$:$	`:`	$\notin$	`\notin`	$\neq$	`\neq` or `\ne`

[a] Use the latexsym package to access this symbol

Table 4.5: Binary Operators.

$+$	`+`	$-$	`-`		
$\pm$	`\pm`	$\mp$	`\mp`	$\triangleleft$	`\triangleleft`
$\cdot$	`\cdot`	$\div$	`\div`	$\triangleright$	`\triangleright`
$\times$	`\times`	$\setminus$	`\setminus`	$\star$	`\star`
$\cup$	`\cup`	$\cap$	`\cap`	$*$	`\ast`
$\sqcup$	`\sqcup`	$\sqcap$	`\sqcap`	$\circ$	`\circ`
$\vee$	`\vee` , `\lor`	$\wedge$	`\wedge` , `\land`	$\bullet$	`\bullet`
$\oplus$	`\oplus`	$\ominus$	`\ominus`	$\diamond$	`\diamond`
$\odot$	`\odot`	$\oslash$	`\oslash`	$\uplus$	`\uplus`
$\otimes$	`\otimes`	$\bigcirc$	`\bigcirc`	$\amalg$	`\amalg`
$\bigtriangleup$	`\bigtriangleup`	$\bigtriangledown$	`\bigtriangledown`	$\dagger$	`\dagger`
$\lhd$ [a]	`\lhd` [a]	$\rhd$ [a]	`\rhd` [a]	$\ddagger$	`\ddagger`
$\unlhd$ [a]	`\unlhd` [a]	$\unrhd$ [a]	`\unrhd` [a]	$\wr$	`\wr`

Table 4.6: BIG Operators.

$\sum$	\sum	$\bigcup$	\bigcup	$\bigvee$	\bigvee	$\bigoplus$	\bigoplus
$\prod$	\prod	$\bigcap$	\bigcap	$\bigwedge$	\bigwedge	$\bigotimes$	\bigotimes
$\coprod$	\coprod	$\bigsqcup$	\bigsqcup			$\bigodot$	\bigodot
$\int$	\int	$\oint$	\oint			$\biguplus$	\biguplus

Table 4.7: Arrows.

$\leftarrow$	\leftarrow or \gets	$\longleftarrow$	\longleftarrow	$\uparrow$	\uparrow
$\rightarrow$	\rightarrow or \to	$\longrightarrow$	\longrightarrow	$\downarrow$	\downarrow
$\leftrightarrow$	\leftrightarrow	$\longleftrightarrow$	\longleftrightarrow	$\updownarrow$	\updownarrow
$\Leftarrow$	\Leftarrow	$\Longleftarrow$	\Longleftarrow	$\Uparrow$	\Uparrow
$\Rightarrow$	\Rightarrow	$\Longrightarrow$	\Longrightarrow	$\Downarrow$	\Downarrow
$\Leftrightarrow$	\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	$\Longleftrightarrow$	\iff (bigger spaces)	$\leadsto$	\leadsto [a]

[a] Use the latexsym package to access this symbol

Table 4.8: Delimiters.

(	(	)	)	$\uparrow$	\uparrow	$\Uparrow$	\Uparrow
[	[or \lbrack	]	] or \rbrack	$\downarrow$	\downarrow	$\Downarrow$	\Downarrow
{	\{ or \lbrace	}	\} or \rbrace	$\updownarrow$	\updownarrow	$\Updownarrow$	\Updownarrow
$\langle$	\langle	$\rangle$	\rangle	$\vert$	| or \vert	$\Vert$	\\| or \Vert
$\lfloor$	\lfloor	$\rfloor$	\rfloor	$\lceil$	\lceil	$\rceil$	\rceil
/	/	\	\backslash		. (dual. empty)		

Table 4.9: Large Delimiters.

$\lgroup$	\lgroup	$\rgroup$	\rgroup	$\lmoustache$	\lmoustache	$\rmoustache$	\rmoustache
$\arrowvert$	\arrowvert	$\Arrowvert$	\Arrowvert	$\bracevert$	\bracevert		

Table 4.10: Miscellaneous Symbols.

$\dots$	\dots	$\cdots$	\cdots	$\vdots$	\vdots	$\ddots$	\ddots
$\hbar$	\hbar	$\imath$	\imath	$\jmath$	\jmath	ℓ	\ell
$\Re$	\Re	$\Im$	\Im	$\aleph$	\aleph	$\wp$	\wp
$\forall$	\forall	$\exists$	\exists	$\mho$ [a]	\mho [a]	∂	\partial
$'$	'	$\prime$	\prime	$\emptyset$	\emptyset	∞	\infty
∇	\nabla	$\triangle$	\triangle	$\Box$ [a]	\Box [a]	$\Diamond$ [a]	\Diamond [a]
$\bot$	\bot	$\top$	\top	$\angle$	\angle	$\surd$	\surd
$\diamondsuit$	\diamondsuit	$\heartsuit$	\heartsuit	$\clubsuit$	\clubsuit	$\spadesuit$	\spadesuit
$\neg$	\neg or \lnot	$\flat$	\flat	$\natural$	\natural	$\sharp$	\sharp

[a] Use the latexsym package to access this symbol

Table 4.11: Non-Mathematical Symbols.

These symbols can also be used in text mode.

†	\dag	§	\S	©	\copyright
‡	\ddag	¶	\P	£	\pounds

Table 4.12: AMS Delimiters.

⌜	\ulcorner	⌝	\urcorner	⌞	\llcorner	⌟	\lrcorner
|	\lvert	|	\rvert	‖	\lVert	‖	\rVert

Table 4.13: AMS Greek and Hebrew.

$\digamma$	\digamma	$\varkappa$	\varkappa	$\beth$	\beth	$\daleth$	\daleth	$\gimel$	\gimel

Table 4.14: AMS Binary Relations.

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

Table 4.15: AMS Arrows.

$\dashleftarrow$	\dashleftarrow	$\dashrightarrow$	\dashrightarrow	$\multimap$	\multimap
$\leftleftarrows$	\leftleftarrows	$\rightrightarrows$	\rightrightarrows	$\upuparrows$	\upuparrows
$\leftrightarrows$	\leftrightarrows	$\rightleftarrows$	\rightleftarrows	$\downdownarrows$	\downdownarrows
$\Lleftarrow$	\Lleftarrow	$\Rrightarrow$	\Rrightarrow	$\upharpoonleft$	\upharpoonleft
$\twoheadleftarrow$	\twoheadleftarrow	$\twoheadrightarrow$	\twoheadrightarrow	$\upharpoonright$	\upharpoonright
$\leftarrowtail$	\leftarrowtail	$\rightarrowtail$	\rightarrowtail	$\downharpoonleft$	\downharpoonleft
$\leftrightharpoons$	\leftrightharpoons	$\rightleftharpoons$	\rightleftharpoons	$\downharpoonright$	\downharpoonright
$\Lsh$	\Lsh	$\Rsh$	\Rsh	$\rightsquigarrow$	\rightsquigarrow
$\looparrowleft$	\looparrowleft	$\looparrowright$	\looparrowright	$\leftrightsquigarrow$	\leftrightsquigarrow
$\curvearrowleft$	\curvearrowleft	$\curvearrowright$	\curvearrowright		
$\circlearrowleft$	\circlearrowleft	$\circlearrowright$	\circlearrowright		

Table 4.16: AMS Negated Binary Relations and Arrows.

$\nless$	\nless	$\ngtr$	\ngtr	$\varsubsetneqq$	\varsubsetneqq
$\lneq$	\lneq	$\gneq$	\gneq	$\varsupsetneqq$	\varsupsetneqq
$\nleq$	\nleq	$\ngeq$	\ngeq	$\nsubseteqq$	\nsubseteqq
$\nleqslant$	\nleqslant	$\ngeqslant$	\ngeqslant	$\nsupseteqq$	\nsupseteqq
$\lneqq$	\lneqq	$\gneqq$	\gneqq	$\nmid$	\nmid
$\lvertneqq$	\lvertneqq	$\gvertneqq$	\gvertneqq	$\nparallel$	\nparallel
$\nleqq$	\nleqq	$\ngeqq$	\ngeqq	$\nshortmid$	\nshortmid
$\lnsim$	\lnsim	$\gnsim$	\gnsim	$\nshortparallel$	\nshortparallel
$\lnapprox$	\lnapprox	$\gnapprox$	\gnapprox	$\nsim$	\nsim
$\nprec$	\nprec	$\nsucc$	\nsucc	$\ncong$	\ncong
$\npreceq$	\npreceq	$\nsucceq$	\nsucceq	$\nvdash$	\nvdash
$\precneqq$	\precneqq	$\succneqq$	\succneqq	$\nvDash$	\nvDash
$\precnsim$	\precnsim	$\succnsim$	\succnsim	$\nVdash$	\nVdash
$\precnapprox$	\precnapprox	$\succnapprox$	\succnapprox	$\nVDash$	\nVDash
$\subsetneq$	\subsetneq	$\supsetneq$	\supsetneq	$\ntriangleleft$	\ntriangleleft
$\varsubsetneq$	\varsubsetneq	$\varsupsetneq$	\varsupsetneq	$\ntriangleright$	\ntriangleright
$\nsubseteq$	\nsubseteq	$\nsupseteq$	\nsupseteq	$\ntrianglelefteq$	\ntrianglelefteq
$\subsetneqq$	\subsetneqq	$\supsetneqq$	\supsetneqq	$\ntrianglerighteq$	\ntrianglerighteq
$\nleftarrow$	\nleftarrow	$\nrightarrow$	\nrightarrow	$\nleftrightarrow$	\nleftrightarrow
$\nLeftarrow$	\nLeftarrow	$\nRightarrow$	\nRightarrow	$\nLeftrightarrow$	\nLeftrightarrow

Table 4.17: AMS Binary Operators.

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

Table 4.18: AMS Miscellaneous.

$\hbar$	\hbar	$\hslash$	\hslash	$\Bbbk$	\Bbbk
$\square$	\square	$\blacksquare$	\blacksquare	Ⓢ	\circledS
$\vartriangle$	\vartriangle	$\blacktriangle$	\blacktriangle	$\complement$	\complement
$\triangledown$	\triangledown	$\blacktriangledown$	\blacktriangledown	$\Game$	\Game
$\lozenge$	\lozenge	$\blacklozenge$	\blacklozenge	$\bigstar$	\bigstar
$\angle$	\angle	$\measuredangle$	\measuredangle	$\sphericalangle$	\sphericalangle
$\diagup$	\diagup	$\diagdown$	\diagdown	$\backprime$	\backprime
$\nexists$	\nexists	$\Finv$	\Finv	$\varnothing$	\varnothing
$\eth$	\eth	$\mho$	\mho		

4.5 Another Example – Standard Normal Distribution

The standard normal distribution function is defined by

$$\Phi(z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z} e^{-u^2/2} du.$$

Using the power series expansion

$$e^x = \sum_{k=0}^{\infty} \frac{x^k}{k!}$$

derive the following power series for $\Phi(z)$.

$$\Phi(z) = \frac{1}{2} + \frac{1}{\sqrt{2\pi}} \sum_{n=0}^{\infty} \frac{(-1)^n z^{2n+1}}{n!\, 2^n (2n+1)}$$

Put

$$\exp\left\{-\frac{u^2}{2}\right\} = \sum_{n=0}^{\infty} \frac{\left(-u^2/2\right)^n}{n!}$$

Then we have:

$$
\begin{aligned}
\Phi &= \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z} \sum_{n=0}^{\infty} \frac{\left(-u^2/2\right)^n}{n!}\, du \\
&= \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z} \sum_{n=0}^{\infty} \frac{(-1)^n u^{2n}}{2^n n!} \\
&= \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{0} \sum_{n=0}^{\infty} \frac{(-1)^n u^{2n}}{2^n n!}\, du + \frac{1}{\sqrt{2\pi}} \int_{0}^{z} \sum_{n=0}^{\infty} \frac{(-1)^n u^{2n}}{2^n n!}\, du \\
&= \frac{1}{2} + \sum_{n=0}^{\infty} \int_{0}^{z} \frac{(-1)^n u^{2n}}{2^n n!}\, du \\
&= \frac{1}{2} + \sum_{n=0}^{\infty} \left[\frac{(-1)^n u^{2n+1}}{2^n n!(2n+1)} \right]_{u=0}^{u=z} \\
&= \frac{1}{2} + \frac{1}{\sqrt{2\pi}} \sum_{n=0}^{\infty} \left[\frac{(-1)^n z^{2n+1}}{2^n n!(2n+1)} - \frac{(-1)^n 0^{2n+1}}{2^n n!(2n+1)} \right] \\
&= \frac{1}{\sqrt{2\pi}} \sum_{n=0}^{\infty} \frac{(-1)^n z^{2n+1}}{2^n n!(2n+1)}
\end{aligned}
$$

The derivation was produced with the following LaTeX source code:

```
{\setlength\arraycolsep{2pt}
  \begin{eqnarray*}
    \Phi & = & \frac{1}{\sqrt{2\pi}} \int^z_{-\infty}
                \sum^{\infty}_{n=0}
                \frac{\left(-u^2/2\right)^n}{n!}\, du \\
         & = & \frac{1}{\sqrt{2\pi}} \int^z_{-\infty}
                \sum^{\infty}_{n=0}
                \frac{(-1)^n u^{2n}}{2^n n!} \\
         & = & \frac{1}{\sqrt{2\pi}} \int^0_{-\infty}
                \sum^{\infty}_{n=0}
                \frac{(-1)^n u^{2n}}{2^n n!} \, du
           +    \frac{1}{\sqrt{2\pi}} \int^z_{0}
                \sum^{\infty}_{n=0}
                \frac{(-1)^n u^{2n}}{2^n n!} \, du \\
         & = & \frac{1}{2} +  \sum^{\infty}_{n=0}
                \int^z_{0} \frac{(-1)^n u^{2n}}{2^n n!}\, du \\
         & = & \frac{1}{2} +  \sum^{\infty}_{n=0} \left[
                \frac{(-1)^n u^{2n+1}}{2^n n! (2n+1)}
                \right]^{u = z}_{u = 0} \\
         & = & \frac{1}{2} + \frac{1}{\sqrt{2\pi}}
                \sum^{\infty}_{n=0} \left[
```

```
                \frac{(-1)^n z^{2n+1}}{2^n n! (2n+1)} -
                \frac{(-1)^n 0^{2n+1}}{2^n n! (2n+1)} \right] \\
        & = & \frac{1}{\sqrt{2\pi}} \sum^{\infty}_{n=0}
                \frac{(-1)^n z^{2n+1}}{2^n n! (2n+1)}
  \end{eqnarray*}
}
```

4.6 Exercise

You are to typeset the following paragraph. These hints may be useful:

- ∞ is produced with `\infty`.
- A big horizontal space in the equation may be produced with `\qquad`.
- $\sim$ may be produced with `\sim`.
- A big left { and right }, may be produced with `\left\{` and `\right\}`, respecitvely.
- In math mode, if you wish to typeset normal text, you may want to use `\mbox{}`.
- $\times$ may be produced by `\times`.

We say that a random variable X has a **Normal Distribution**, if it has a **Probability Density Function, P.D.F**:

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} \exp\left\{-\frac{(x-\mu)^2}{2\sigma^2}\right\} \qquad -\infty < x < \infty$$

where μ and σ^2 are the parameters of the distribution, and they satisfy $-\infty < x < \infty$, and $\sigma > 0$. We write $X \sim N(\mu, \sigma^2)$.

The mean is given by:

$$\begin{aligned}
E(X) &= \int_{-\infty}^{\infty} x f(x)\, dx \\
&= \int_{-\infty}^{\infty} x \frac{1}{\sqrt{2\pi}\sigma} \exp\left\{-\frac{(x-\mu)^2}{2\sigma^2}\right\} dx \\
&= \int_{-\infty}^{\infty} (\mu + \sigma z) \frac{1}{\sqrt{2\pi}} \exp\left\{-\frac{z^2}{2}\right\} dz \qquad (\text{setting } z = \frac{x-\mu}{\sigma}) \\
&= \mu \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} \exp\left\{-\frac{z^2}{2}\right\} dz + \sigma \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} z \exp\left\{-\frac{z^2}{2}\right\} dz \\
&= \mu \times 1 + 0 \\
&= \mu
\end{aligned}$$

Chapter 5

Using Graphics

Inserting a picture, like Fig **??**, into a LaTeX document is not a straightforward thing. If you want to put a picture into Microsoft Word, you can simply copy the picture and paste it in. However in LaTeX you need a little bit more work. The idea is that you *insert* the picture in by specifying its file name.

Another tricky part is that LaTeX does not support many graphics formats. If you want to view your document in the DVI format (in other words you compile your document with the command `latex`), then the picture needs to be in either PS (PostScript) or EPS (Encapsulated PostScript) format [1]. If you want to view your document in PDF format (produced by the `pdflatex` command), then the picture must be in either PDF or PNG format[2]. The graphics conversion is made extremely easy by a free Photoshop clone, The Gimp!, which is included in the CD, or can be downloaded from http://www2.arnes.si/~sopjsimo/gimp/.

The advantage of using LaTeX, on the other hand, is that you can easily update the picture. For example, I have called Fig **??** `normal`, then whenever I redraw the plot, I only need to recompile my LaTeX document (in Microsoft Word I would have to copy and paste again). The other good thing is the picture will not move when I change a platform (if I positioned the picture in a place in Word XP, it may move to another position in Word 97).

To insert figures, you need to use the `graphicx` package, i.e. put the line:

```
\usepackage{graphicx}
```

in your preamble. Note that there is a `graphics` package. You want the package with `x`, as it is easier to use.

Then, you can use something like:

```
\begin{figure}[tbh]
```

[1] Well technically you can insert other formats, but it is a bit tricky.

[2] A newer version of `pdflatex` allows you to use JPEG pictures.

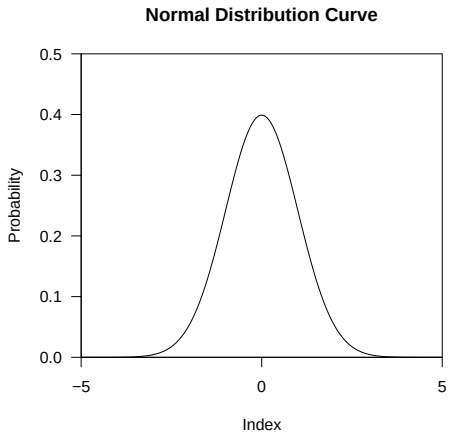

Figure 5.1: Normal Distribution Curve – using `scale`

```
  \centering
  \begin{center}
    \includegraphics[scale = 0.5, clip]{normal}
  \end{center}
  \caption{Normal Distribution Curve -- using \texttt{scale}}
  \label{fig:scale}
\end{figure}

\begin{figure}[tbh]
  \centering
  \begin{center}
    \includegraphics[width = 0.5\textwidth, clip]{normal}
  \end{center}
  \caption{Normal Distribution Curve -- using \texttt{width}}
  \label{fig:width}
\end{figure}

\begin{figure}[tbh]
  \centering
  \begin{center}
    \includegraphics[height = 0.5\textheight, clip]{normal}
  \end{center}
  \caption{Normal Distribution Curve -- using height}
  \label{fig:height}
\end{figure}
```

to produce Fig 5.1, 5.2, 5.3, respectively.

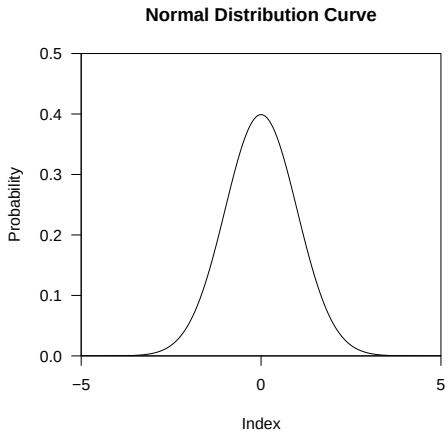

Figure 5.2: Normal Distribution Curve – using `width`

Basically your figures must be enclosed in the `figure` environment. Then the main part is the `\includegraphics` command. You can put the optional parameters within the square brackets `[]`, and the file name of the figure in the curly brackets `{}`. For more information about LaTeX graphics, please refer to The LaTeX Graphics Companion.

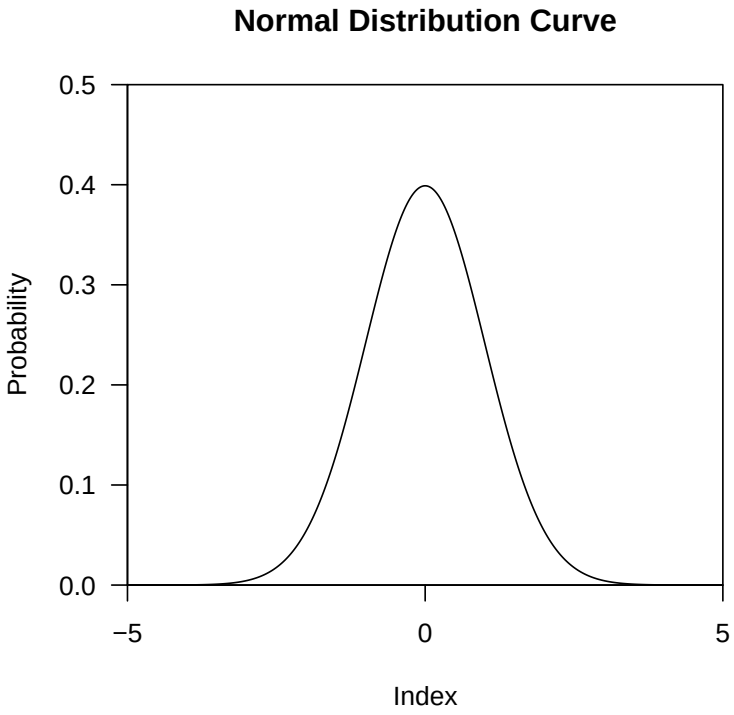

Figure 5.3: Normal Distribution Curve – using height

Chapter 6

Doing Presentation

There are at least 10 ways to choose from if you want to do your presentations with LaTeX. For a list of them please refer to http://www.miwie.org/presentations/presentations.html.

I will not attempt to explain all the different methods, as it is not possible to do so in a few paragraphs. Rather, I am going to choose two of the easiest ways.

6.1 TeXPoint

It is by far the easiest method I can find. TeXPoint, http://raw.cs.berkeley.edu/texpoint/index.htm, is a "LaTeX add-in for PowerPoint". It is essentially a set of PowerPoint macros which allows you to typeset LaTeX equations within PowerPoint. Why do you want to do that? Bruce Tsai has put up a set of PowerPoint slides at http://www.public.iastate.edu/~aero492/notes/Intro_to_TeXPoint.ppt, which includes comparison between equations typeset by Microsoft Equation Editor and LaTeX. Once you get used to LaTeX mathematics symbols and equations, you will not stand on the ugly symbols and equations produced by a certain equation editor.

6.2 pdfscreen

Once you become very confident with LaTeX, you may want to try `pdfscreen`, http://www.river-valley.com/download/. It is written by someone from the Economics Department at the University of Auckland. You may need to, however, do some programming to change `pdfscreen.sty` to suit your needs though. This procedure is well beyond the scope of this documentation, therefore I am not going to explain here.

Chapter 7

Resources

7.1 On-line Resources

- LaTeX Project Homepage http://www.latex-project.org/
- Claus Dethlefsen's LaTeX, Emacs for your PC http://www.math.auc.dk/~dethlef/Tips/introduction.html
- MikTeX http://www.miktex.org/
- The Gimp! http://www2.arnes.si/~sopjsimo/gimp/
- Presentation Packages http://www.math.uakron.edu/~dpstory/pdf_present.html
- TeXPoint http://raw.cs.berkeley.edu/texpoint/index.htm.
- `pdfscreen` http://www.river-valley.com/download/.

7.2 References

7.2.1 FREE stuff for Beginners

- The (Not So) Short Introduction to LaTeX 2_ε ; http://www.ctan.org/tex-archive/info/lshort/english/
- Using Imported Graphics in LaTeX 2_ε ftp://ctan.tug.org/tex-archive/info/epslatex.pdf
- LaTeX 2_ε for authors, ftp://ftp.tex.ac.uk/tex-archive/macros/latex/base/usrguide.tex.
- Beginner's LaTeX, http://www.silmaril.ie/downloads/documents/beginlatex.pdf.

- A list of LOTS of other stuff, http://www-h.eng.cam.ac.uk/help/tpl/textprocessing/.

7.2.2 Beginners to Intermediate Users

- LaTeX: A document Preparation System, User's guide and Reference manual; *Leslie Lamport* (US$40)

7.2.3 Beginners to Advanced Users

- The LaTeX Companion. *Michel Goossens, Frank Mittelbach, Alexander Samarin.* (US$40.)
- The Latex Web Companion: Integrating Tex, Html and Xml. *Michel Goossens et. al.* (US$40)
- The LaTeX Graphics Companion: Illustrating Documents with TeX and Postscript(R) *Michel Goossens et. al.* (US$48)

7.2.4 Advanced Users

- The TEXbook; *Donald Ervin Knuth* (US$43)

Appendix A

Source Codes

I have divided this book into several files. A global file which contains some global source codes (`book.tex`) which reads in each chapter files.

A.1 Global Environment

```
\ifx\pdfoutput\undefined % We're not running pdftex
\documentclass[11pt,a4paper,twoside]{book}
\else
\documentclass[pdftex,11pt,a4paper,twoside]{book}
\usepackage{thumbpdf}
\pdfcompresslevel=9
\fi
\usepackage{graphicx}
\usepackage{alltt}
\usepackage{makeidx}
\usepackage{url}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{latexsym}
\usepackage{xspace}
\usepackage{fancyhdr}
\pagestyle{fancy}
\lhead[{\bfseries\thepage}]%
      {\bfseries\rightmark}
\rhead[{\bfseries\leftmark}]%
      {\bfseries\thepage}
\cfoot{}
% are we in pdftex ????
\ifx\pdfoutput\undefined % We're not running pdftex
```

```
\else
\RequirePackage[colorlinks,hyperindex,plainpages=false]{hyperref}
\def\pdfBorderAttrs{/Border [0 0 0] } % No border arround Links
\fi

\newcommand{\latex}{\LaTeX\xspace}
\newcommand{\tex}{\TeX\xspace}
\newcommand{\postscript}{PostScript\xspace}
\newcommand{\wi}[1]{\textbf{\index{#1}#1}}

% Symbol Entry for Math Symbol Tables
%
\newcommand{\X}[1]{$#1$&\texttt{\string#1}\hspace*{1ex}}
% normal text ....
\newcommand{\SC}[1]{#1&\texttt{\string#1}\hspace*{1ex}}
% for accents in text mode
\newcommand{\A}[1]{#1&\texttt{\string#1}\hspace*{1ex}}
\newcommand{\B}[2]{#1#2&\texttt{\string#1{} #2}\hspace*{1ex}}

\newcommand{\W}[2]{$#1{#2}$&
  \texttt{\string#1}\texttt{\string{\string#2\string}}\hspace*{1ex}}
\newcommand{\Y}[1]{$\big#1$ &\texttt{\string#1}}  %
% Mathsymbol Table
\newsavebox{\symbbox}
\newenvironment{symbols}[1]%
{\par\vspace*{2ex}
\renewcommand{\arraystretch}{1.1}
\begin{lrbox}{\symbbox}
\hspace*{4ex}\begin{tabular}{@{}#1@{}}}%
{\end{tabular}\end{lrbox}\makebox[\textwidth]{\usebox{\symbbox}}\par\medskip}
%
% Special Prep for AMS Symbols Printout
% Should work if AMS is not available
%

% we have no PS versions of the rsfs fonts ... so this is a nogo for pdf
\ifx\pdfoutput\undefined % We're not running pdftex
\IfFileExists{mathrsfs.sty}
  {\RequirePackage{mathrsfs}\let\MathRSFS\mathscr\let\mathscr\relax}{}
\fi
\IfFileExists{amssymb.sty}
  {\let\noAMS\relax \RequirePackage{amssymb}}
  {\def\noAMS{\endinput}\RequirePackage{latexsym}}
\IfFileExists{eucal.sty}
```

```
  {\RequirePackage[mathscr]{eucal}}
  {\IfFileExists{euscript.sty}
  {\RequirePackage{euscript}}{}}
%\IfFileExists{eufrak.sty}
%  {\RequirePackage{eufrak}}{}
\IfFileExists{amsbsy.sty}
  {\RequirePackage{amsbsy}}{}



\makeindex

\begin{document}
\frontmatter
\title{
\Huge\bf A Quick Introduction to \LaTeXe \\[5mm]
\vspace{1in}}

\author{
Ko-Kang Kevin Wang \\
Student Learning Centre\\
University of Auckland
\vspace*{\fill}}

\maketitle

\input{contrib}

\tableofcontents

\mainmatter
% Introduction, modify lshort
\input{intro}

% Obtaining, w/ Claus's tut
\input{install}

% Basic document format, inc fonts type
\input{basic}

% Mathematics, inc proof of bi-variate normal
\input{math}

% Using Graphics -- ps, pdf, png
```

```
\input{graphics}

% Doing Presentations -- TeXPoint, pdfscreen
\input{present}

% Resources
\input{resources}

\appendix
\input{source}

%\printindex

\end{document}
```

A.2 Chapter 1

```
\chapter{Introduction}
\label{cha:intro}

It is assumed that, if you are reading this, you probably don't have a
lot of experience with \latex, or probably have never even heard of
it until today.  If you have been using \latex for quite a while, then
this document is not suitable for you.

In this document, I will try my best to write in an intuitive way.  It
is assumed that you have had at least some experience with a
\index{GUI}{GUI} Word Processing software, such as Microsoft Word
before.

Most people, myself included, will hate \latex when they first start
learning it.  Compared with Microsoft Word (or equivalent), \latex is
extremely difficult to pick up.  However, once you become used to its
syntax, you will love it.  When I first met \latex, I found it was
very difficult to use it, and tried to use Microsoft Word to avoid
\latex.  But now, I rarely use Word, and always use \latex to do my
work.

In this document, I will only give a very brief introduction to \latex
typesetting.  More resources can be obtained for free on the Internet,
and I have a list of these resources in Chapter \ref{cha:resource}.

Now, let's begin by look at the history of \latex.
```

```
\section{A long long time ago...}
\label{sec:tex}

Back in the dark ages in the pre-PC time, typsetting a scientific
document was extremely difficult.  Then, in 1977, the infamous
mathematician/computer scientist, \index{Knuth, Donald E.}Donald E.
Knuth, started writing a \tex typsetting engine, which was targetted
primarily at producing good-quality mathematical formulae.

\tex reached its maturity in 1982, and in 1989 some slight enhancement
was made to support multiple languages.  It is renowned for its
extreme stability and portability.

The version is converging to $\pi$ and is now 3.14159.  \tex is
pronounced as \emph{Tech}, not \emph{Tax}, and is written as
\texttt{TeX} in an ASCII environment.


\section{From \tex to \latex}
\label{sec:latex}

One of the reasons Don Knuth is famous, is that not many people
understand his work.  When he first released \tex and the accompanying
documentation, he was probably the only person who could actually use
it well enough to write a book with the software.

A few years later, people started to understand his work, and
\index{Lamport, Leslie}{Leslie Lamport} went on to write \latex on top
of the \tex engine.  Since then, it has become widely used in
the science community, and is famous for its stability,
portability, and quality.  In fact, in terms of mathematical formulae,
it is unsurpassed in its typographical quality.

\latex is pronounced as \emph{Lay-Tech} or \emph{Lah-Tech}, not
\emph{lay-tax}.  In an ASCII world, it is written as \texttt{LaTeX}.


\section{To \latex or not to \latex}
\label{sec:procon}

If you are sure that you will never need to typeset long document,
publish a book in the scientific community, typeset mathematical
```

```
formulae or equations, then you probably don't need to learn \latex.
You will be happier to keep working in Word.

Microsoft Word, undeniably, has its advantages.  For one thing, it is
the most commonly used typesetting tool.  It is also easier to produce
tables (provided the tables are not so long that they stretch to
several pages).  It is also easier to pick up, and can include many
different picture formats without \emph{too much} trouble.

On the other hand, if you ever need to typeset mathematics, write long
documents (e.g. a thesis), and you only care about the aesthetics,
then you should consider using \latex.  For one thing, \latex itself
and all its editors (except WinEdt) are free.  It also does most of
the professional layout and typesetting for you.  It has excellent
math and formulae support, and handles bibliography, index and cross
referencing with ease.  Also, since \latex documents are in plain
ASCII format (at least before you compile it into other formats), it
is very small to transfer via the Internet, and you can easily FTP
your \latex document between workplace and home.  Best of all, it is
available on virtually all kind of operating systems, and you can
produce PDF documents directly from \latex documents without buying
commercial software such as Adobe Acrobat.

In the next chapter, we will look at how to get \latex set up and
running under a Windows environment.

%%% Local Variables:
%%% mode: latex
%%% TeX-master: "book"
%%% End:
```

A.3 Chapter 3

Execise Answers:

```
\begin{table}[htbp]
  \centering
  \begin{tabular}{lrr}
    \textbf{Party} & \textbf{Votes} & \textbf{Seats}\\
    Labour & 41.26 & 52\\
    National & 20.93 & 27 \\
    NZ First & 10.38 & 13 \\
    Act & 7.14 & 9 \\
    Green & 7.00 & 9 \\
```

```
      United Future & 6.69 & 8 \\
      Progressive Coalition & 1.70 & 2 \\
    \end{tabular}
    \caption{2002 General Election Results}
    \label{tab:election}
  \end{table}
```

A.4 Chapter 4

Exercise Answers:

```
\begin{center}
  \line(1,0){190}
\end{center}
\begin{quote}
We say that a random variable \textit{X} has a \textbf{Normal
  Distribution}, if it has a \textbf{Probability Density Function,
  P.D.F}:
\begin{eqnarray*}
  \label{eq:standnorm}
  f(x) &=& \frac{1}{\sqrt{2\pi}\sigma}
           \exp{\left\{-\frac{(x - \mu)^2}{2\sigma^2}\right\}}
           \qquad
           -\infty < x < \infty
\end{eqnarray*}
where $\mu$ and $\sigma^2$ are the parameters of the distribution, and
they satisfy $-\infty < x < \infty$, and $\sigma > 0$.  We write $X
\sim N(\mu, \sigma^2)$.

The mean is given by:
\begin{eqnarray*}
  E(X) &=& \int^{\infty}_{-\infty}{xf(x)\, dx} \\
       &=& \int^{\infty}_{-\infty}
           {x\frac{1}{\sqrt{2\pi}\sigma}
            \exp{\left\{-\frac{(x - \mu)^2}{2\sigma^2}\right\}\,
              dx}} \\
       &=& \int^{\infty}_{-\infty}
           {(\mu + \sigma z)\frac{1}{\sqrt{2\pi}}
             \exp\left\{-\frac{z^2}{2}\right\}\,
             dz} \qquad
           (\mbox{setting } z = \frac{x - \mu}{\sigma}) \\
       &=& \mu\int^{\infty}_{-\infty}
           {\frac{1}{\sqrt{2\pi}}
             \exp\left\{-\frac{z^2}{2}\right\}\,
```

```
                dz} + \sigma\int^{\infty}_{-\infty}
              {\frac{1}{\sqrt{2\pi}}z
                \exp\left\{-\frac{z^2}{2}\right\}\,
                dz}\\
          &=& \mu \times 1 + 0 \\
          &=& \mu
    \end{eqnarray*}
    \end{quote}
    \begin{center}
      \line(1,0){190}
    \end{center}
```

A.5 Chapter 6

```
\chapter{Doing Presentation}
\label{cha:present}

There are at least 10 ways to choose from if you want to do your
presentations with \latex.  For a list of them please refer to
\url{http://www.miwie.org/presentations/presentations.html}.

I will not attempt to explain all the different methods, as it is not
possible to do so in a few paragraphs.  Rather, I am going to choose
two of the easiest ways.

\section{TeXPoint}
\label{sec:texpoint}

It is by far the easiest method I can find.
\index{TeXPoint}{TeXPoint},
\url{http://raw.cs.berkeley.edu/texpoint/index.htm}, is a ``\latex
add-in for PowerPoint''.  It is essentially a set of PowerPoint macros
which allows you to typeset \latex equations within PowerPoint.  Why
do you want to do that?  Bruce Tsai has put up a set of PowerPoint
slides at
\url{http://www.public.iastate.edu/~aero492/notes/Intro_to_TeXPoint.ppt},
which includes comparison between equations typeset by Microsoft
Equation Editor and \latex.  Once you get used to \latex mathematics
symbols and equations, you will not stand on the ugly symbols and
equations produced by a certain equation editor.


\section{pdfscreen}
```

```
\label{sec:pdfscreen}

Once you become very confident with \latex, you may want to try
\index{pdfscreen}{\texttt{pdfscreen}},
\url{http://www.river-valley.com/download/}.  It is written by someone
from the Economics Department at the University of Auckland.  You may
need to, however, do some programming to change \texttt{pdfscreen.sty}
to suit your needs though.  This procedure is well beyond the scope of
this documentation, therefore I am not going to explain here.

%%% Local Variables:
%%% mode: latex
%%% TeX-master: "book"
%%% End:
```

A.6 Chapter 7

```
\chapter{Resources}
\label{cha:resource}

\section{On-line Resources}
\label{sec:online}
\begin{itemize}
\item LaTeX Project Homepage \url{http://www.latex-project.org/}
\item Claus Dethlefsen's LaTeX, Emacs for your PC
  \url{http://www.math.auc.dk/~dethlef/Tips/introduction.html}
\item Mik\TeX\ \url{http://www.miktex.org/}
% I used pdfscreen
\item The Gimp! \url{http://www2.arnes.si/~sopjsimo/gimp/}
\item Presentation Packages
  \url{http://www.math.uakron.edu/~dpstory/pdf_present.html}
\item TeXPoint \url{http://raw.cs.berkeley.edu/texpoint/index.htm}.
\item \texttt{pdfscreen} \url{http://www.river-valley.com/download/}.
\end{itemize}

\section{References}
\label{sec:ref}

\subsection{FREE stuff for Beginners}
\label{sec:freeBeginner}
\begin{itemize}
\item The (Not So) Short Introduction to \LaTeXe\ ;
  \url{http://www.ctan.org/tex-archive/info/lshort/english/}
```

```
\item Using Imported Graphics in \LaTeXe\
  \url{ftp://ctan.tug.org/tex-archive/info/epslatex.pdf}
\item \LaTeXe\ for authors,
  \url{ftp://ftp.tex.ac.uk/tex-archive/macros/latex/base/usrguide.tex}.
\item Beginner's \latex,
  \url{http://www.silmaril.ie/downloads/documents/beginlatex.pdf}.
\item A list of LOTS of other stuff,
  \url{http://www-h.eng.cam.ac.uk/help/tpl/textprocessing/}.
\end{itemize}

\subsection{Beginners to Intermediate Users}
\label{sec:beginInter}
\begin{itemize}
\item LaTeX: A document Preparation System, User's guide and Reference
  manual; \textit{Leslie Lamport} (US\$40)
\end{itemize}

\subsection{Beginners to Advanced Users}
\label{sec:beginAdv}
\begin{itemize}
\item The LaTeX Companion.  \textit{Michel Goossens, Frank Mittelbach,
    Alexander Samarin}. (US\$40.)
\item The Latex Web Companion: Integrating Tex, Html and
  Xml. \textit{Michel Goossens et. al.} (US\$40)
\item The LaTeX Graphics Companion: Illustrating Documents with TeX
  and Postscript(R) \textit{Michel Goossens et. al.} (US\$48)
\end{itemize}

\subsection{Advanced Users}
\label{sec:advanced}
\begin{itemize}
\item The \TeX book; \textit{Donald Ervin Knuth} (US\$43)
\end{itemize}

%%% Local Variables:
%%% mode: latex
%%% TeX-master: "book"
%%% End:
```

Index