1 Draft disclaimer

This document as you see it now is both incomplete and in need of fact-checking. It is currently published only because I think it is still somewhat more useful, to the cautious reader, than it not being published.

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2 Introduction

This is intended to serve as a quick-start tutorial for \LaTeX, assuming you’re somewhat familiar with HTML or markup in general, before drifting into miscellaneous notes.

I am not a \LaTeX expert; this is purely compiled from my own “get this working” research. However, I hope it will be useful, despite all the other \LaTeX tutorials already existant, as I have attempted to present a document that doesn’t just give you simple examples but explains the core syntax to help you understand what you’re doing, without a lengthy explanation of \LaTeX concepts. [TODO: clarify this explanation.]

Please note that even though this is not a HTML document, it does contain hyperlinks.

3 Software

I currently use \TeX Live installed through MacPorts, and TextMate for editing/preview.

4 Fundamentals

\LaTeX originated as a macro package for \TeX. As a consequence, the features of \LaTeX are defined in terms of \TeX, and there are some elements of \TeX which are deprecated for ordinary use in \LaTeX.

[TODO: talk about the antitypewriterness and imperativeness of \LaTeX.]

5 Core syntax and semantics

5.1 Lexical structure

Much like HTML, runs of whitespace are presented as a single space. (Furthermore, \LaTeX’s model tends to treating space as a flexible gap between words rather than as an ordinary character, so as to well support justification.)

The following characters or sequences of characters are special.

<table>
<thead>
<tr>
<th>Character</th>
<th>Purpose</th>
<th>Escaped</th>
</tr>
</thead>
<tbody>
<tr>
<td>\</td>
<td>name a command</td>
<td>textbackslash</td>
</tr>
<tr>
<td>$</td>
<td>math mode</td>
<td>$</td>
</tr>
<tr>
<td>{</td>
<td>begin group [TODO: terminology]</td>
<td>{</td>
</tr>
<tr>
<td>}</td>
<td>end group</td>
<td>}</td>
</tr>
<tr>
<td>&amp;</td>
<td>tab</td>
<td>&amp;</td>
</tr>
<tr>
<td>%</td>
<td>comment to end of line</td>
<td>%</td>
</tr>
<tr>
<td>[</td>
<td>begin optional argument (only after a command)</td>
<td>{</td>
</tr>
<tr>
<td>]</td>
<td>end optional argument</td>
<td>}</td>
</tr>
<tr>
<td>#</td>
<td>macro argument</td>
<td>#</td>
</tr>
<tr>
<td>^</td>
<td>math superscript</td>
<td>textasciicircum or ^{ }</td>
</tr>
<tr>
<td>_</td>
<td>math subscript</td>
<td>_</td>
</tr>
<tr>
<td>~</td>
<td>non-breaking space</td>
<td>textasciitilde or ~{ }</td>
</tr>
<tr>
<td>--</td>
<td>en dash</td>
<td>--</td>
</tr>
<tr>
<td>---</td>
<td>em dash</td>
<td>-- --</td>
</tr>
</tbody>
</table>

In addition to the given escapes, all of these can be escaped using the verbatim command, which is \verb, an arbitrary delimiter character, the text to be escaped, and the delimiter again (e.g. \verb!&!); however, \verb has the additional effect of using a monospace font; it is best used for code rather than general or mathematical use of the above symbols.

5.2 Syntactic structure

It is useful to understand that \TeX is an imperative macro-substitution system. It is usually not necessary to explicitly use the imperative nature, but it may be useful in debugging.
There are two forms of nested structure: groups and environments.

A group is delimited by {...}. Groups are most often used to surround arguments. Without a group, the next single character makes up the entire argument; thus the group effectively converts text into a single character. For example, in math mode, “10^{100}” produces “10^{100}”, whereas “10^100” produces “10^{100}”. Omitting the braces is a useful shortcut, but can reduce clarity if used unwisely. Imperatively, a group has the effect of saving and restoring some state, such as font.

Environments are typically (but not necessarily) used for structure which spans many paragraphs. An environment is delimited by \begin{name}...\end{name}; thus it is very much like a HTML/SGML/XML element.

6 Commands

A command is a backslash followed by either a sequence of letters (note, not numbers or underscores) or a single non-letter. (For example, \& is a command which displays an ampersand, not an escaped ampersand. \ is a line break command, not an escaped backslash.)

A command name is be separated from following letters by whitespace. This means that a command followed by text which should be a separate word must be separated by some other syntax: “\textasciitilde foo” produces “˜foo” and “\textasciitilde\ foo” produces “˜ foo”. If whitespace is not wanted, then use an empty group [TODO: terminology]: “\textasciitilde{}foo” produces “˜foo”.

[TODO: rewrite this] Many commands take one or more required arguments; each one of these is usually a block but need not be. For example, \frac{1}{2} is equivalent to \frac{1}{2}.

[TODO: rewrite this] Optional arguments are enclosed in [...].

[TODO: more to go here]

7 Document structure

A minimum \LaTeX{} document is:

\begin{document}
Hello world.
\end{document}

Every \LaTeX{} document must have a document class [TODO: explain choice of document classes], and contain its text in a document environment (which is analogous to HTML <body>). Everything preceding the document is the preamble, which is analogous to the HTML <head>.

The primary things which must be placed in the preamble are \usepackage commands.

8 Formatting and symbols

8.1 Quotes

\LaTeX{} dates from a time when there were no curly quotes, or rather where the ` and ’ ASCII characters were commonly used for paired quotes. Therefore, ` and ’ should be paired and produce ‘single quotes’, whereas ` and ’ produce “double quotes”. The ASCII double quote " is an error.

If the thought of writing your document this way appalls you, see section [TODO: rewrite this].

Also note that ’ will appear as a right curly quote even in verbatim sections; if you’re trying to accurately present source code, see section [15.17].

[1] In package implementations, @ is often temporarily redefined into a letter so that it can be used to define commands which are inaccessible from “ordinary” source. This is done and undone using the commands \makeatletter and \makeatother.
8.2 Lines and paragraphs

Paragraphs (as in HTML <p>) are denoted by text being separated by a blank line, or by the equivalent \par command (usually only in macros).

Specific line breaks which are not paragraph separations (as in HTML <br>) are denoted by \ (which is also used for new rows of tables and mathematical expressions).

This is a paragraph.

This is another paragraph \ whose text has been split into two lines.

8.3 Centering

[TODO: center, \centering]

8.4 Periods, dashes, and whitespace

[TODO: more to go here]

"TeX assumes a period ends a sentence unless it follows an uppercase letter." (Lamport p. 14)
So, put a \_ (where \_ means "space") in a sentence like Smith et al.\ say that .... And, if an uppercase letter ends a sentence, do a \@ before the period: In the class, I gave Bob a C\@.


8.5 Text styles

[TODO: texttt etc.]

9 Large structures

[TODO: more subsections]

9.1 The document title

[TODO: Title data and \maketitle]
[TODO: Customizing title formatting]

9.2 Lists

[TODO: List types: enumerate, itemize, and description]

9.3 Labels and references

[TODO: more to go here]

9.4 Footnotes

Writing a footnote is usually simple: put \footnote{Text of footnote goes here.} at the place where you wish the footnote number to appear.

There are some situations in which this will not work, such as inside a math environment [TODO: confirm this]. In this case, you can instead define the mark and text separately. Put \footnotemark where you wish the number to appear, and then put \footnotetext{...} somewhere in the text after it, but before any other footnote. [TODO: confirm that it’s after and not before.]

9.5 Tables

[TODO: more to go here]
9.6 Quotations and monospace

The quote environment is precisely analogous to HTML <blockquote>.

The verbatim environment is analogous to HTML <pre>, except that it disables \LaTeX interpretation of the contents; it is thus like the nonstandard <xmp> element. Within a paragraph, \verb!...! serves the same function (see \ref{sec:xmp} for syntax). Monospace font without changing text interpretation is provided by \texttt{...} (note the 3 “t’s”). There is no analogue to the distinction between \texttt{<code>} and \texttt{<tt>}.

[TODO: Old note: \ttstyle (check) is like \texttt{<code>}

9.7 Page and column breaks

[TODO: \pagebreak \columnbreak]

10 Layout model

[TODO: more to go here]

kpreid: What is vtop?

\Zz: it creates a vertical box, by stacking a set of horizontal boxes, and the resulting vertical box has its baseline coincident with the first hbox.

\Zz: unlike \vbox, which does the same but the final box has its baseline coincident with the last hbox.

\Zz: you also have \vcenter, which has the final baseline at the center of the resulting vertical box, but it is only allowed in math mode.

Paragraphs can be put in the margin using \marginpar{bla bla}. http://www.f.kth.se/~ante/latex.php

\rlap{foo} outputs foo, then backs up the width of foo. Example aligned linear system:

\begin{align*}
x_1 + 2x_2 + 3x_3 &= b_1 \\
5x_1 &- \rlap{$\phantom{1}x_2$} \phantom{1x_2 + 0x_3} &= b_2 \\
7x_1 + 3x_2 + 5x_3 &= b_3
\end{align*}

Better way to do a linear system (this goes inside a math env):

\begin{alignedat}{3}
x_1 &+ {}& 2x_2 &+ {}& 3x_3 &= b_1 \\
5x_1 &- {}& x_2 & {}& &= b_2 \\
7x_1 &+ {}& 3x_2 &+ {}& 5x_3 &= b_3
\end{alignedat}

11 Packages

[TODO: more to go here]

12 Defining commands

[TODO: rewrite this text] \providecommand defines a command if it does not exist. \newcommand defines a command, requiring that it does not exist. \renewcommand overwrites an existing command. This is used to (a) change the behavior of a package, or (b) uniformly change the appearance of some notation you use while still using the standard name.

[TODO: defining environments]

[TODO: \let]

13 Unicode

\LaTeX assumes ASCII input by default. To permit using UTF-8 input, add to the pream
This enables interpreting the input as UTF-8; however, rendering Unicode characters is a separate issue. By default, a small set of Unicode characters is understood; others will be reported as errors. I do not know what the exact set is.

It is possible to extend the understood Unicode characters using the \DeclareUnicodeCharacter command. Here is a list of the declarations, primarily for mathematics, which I have found useful at some point.

I may well be missing some standard way to obtain definitions like these; if so, let me know!

\DeclareUnicodeCharacter{00AC}{\ifmmode \lnot \else \textlnot \fi} % override
\DeclareUnicodeCharacter{00B0}{\ifmmode ^{\circ} \else \textdegree \fi} % override
\DeclareUnicodeCharacter{00B1}{\ensuremath{\pm}}
\DeclareUnicodeCharacter{00B5}{\mu}
\DeclareUnicodeCharacter{00B7}{\ifmmode \cdot \else \textperiodcentered \fi} % override
\DeclareUnicodeCharacter{00D7}{\ifmmode \times \else \texttimes \fi} % override
\DeclareUnicodeCharacter{00F7}{\ifmmode \div \else \textdiv \fi} % override
\DeclareUnicodeCharacter{0393}{\ensuremath{\Gamma}}
\DeclareUnicodeCharacter{0394}{\ensuremath{\Delta}}
\DeclareUnicodeCharacter{0398}{\ensuremath{\Theta}}
\DeclareUnicodeCharacter{03A3}{\ensuremath{\Sigma}}
\DeclareUnicodeCharacter{03A9}{\ensuremath{\Omega}}
\DeclareUnicodeCharacter{03B1}{\ensuremath{\alpha}}
\DeclareUnicodeCharacter{03B2}{\ensuremath{\beta}}
\DeclareUnicodeCharacter{03B3}{\ensuremath{\gamma}}
\DeclareUnicodeCharacter{03B4}{\ensuremath{\delta}}
\DeclareUnicodeCharacter{03B5}{\ensuremath{\epsilon}}
\DeclareUnicodeCharacter{03B7}{\ifmmode \cdot \else \textperiodcentered \fi} % override
\DeclareUnicodeCharacter{03B8}{\ensuremath{\theta}}
\DeclareUnicodeCharacter{03BB}{\ensuremath{\lambda}}
\DeclareUnicodeCharacter{03C0}{\ensuremath{\pi}}
\DeclareUnicodeCharacter{03C1}{\ensuremath{\rho}}
\DeclareUnicodeCharacter{03C3}{\ensuremath{\sigma}}
\DeclareUnicodeCharacter{03C6}{\ensuremath{\phi}}
\DeclareUnicodeCharacter{03C9}{\ensuremath{\omega}}
\DeclareUnicodeCharacter{2080}{\ensuremath{_0}}
\DeclareUnicodeCharacter{2081}{\ensuremath{_1}}
\DeclareUnicodeCharacter{2082}{\ensuremath{_2}}
\DeclareUnicodeCharacter{2083}{\ensuremath{_3}}
\DeclareUnicodeCharacter{2084}{\ensuremath{_4}}
\DeclareUnicodeCharacter{2085}{\ensuremath{_5}}
\DeclareUnicodeCharacter{2086}{\ensuremath{_6}}
\DeclareUnicodeCharacter{2087}{\ensuremath{_7}}
\DeclareUnicodeCharacter{2088}{\ensuremath{_8}}
\DeclareUnicodeCharacter{2089}{\ensuremath{_9}}
\DeclareUnicodeCharacter{208A}{\ensuremath{+_+}}
\DeclareUnicodeCharacter{208B}{\ensuremath{-_+}}
\DeclareUnicodeCharacter{2190}{\ifmmode \leftarrow \else \textleftarrow \fi} % override
\DeclareUnicodeCharacter{2191}{\ifmmode \uparrow \else \textuparrow \fi} % override
\DeclareUnicodeCharacter{2192}{\ifmmode \rightarrow \else \textrightarrow \fi} % override
\DeclareUnicodeCharacter{2193}{\ifmmode \downarrow \else \textdownarrow \fi} % override
\DeclareUnicodeCharacter{21D0}{\ensuremath{\Leftarrow}}
\DeclareUnicodeCharacter{21D2}{\ensuremath{\Rightarrow}}
\DeclareUnicodeCharacter{21D4}{\ensuremath{\Leftrightarrow}}
\DeclareUnicodeCharacter{2200}{\ensuremath{\forall}}
\DeclareUnicodeCharacter{2203}{\ensuremath{\exists}}
\DeclareUnicodeCharacter{2205}{\ensuremath{\varnothing}}
\DeclareUnicodeCharacter{2212}{\ensuremath{-}}
\DeclareUnicodeCharacter{221D}{\ensuremath{\propto}}
\DeclareUnicodeCharacter{221E}{\ensuremath{\infty}}
\DeclareUnicodeCharacter{2229}{\ensuremath{\cap}}
\DeclareUnicodeCharacter{222A}{\ensuremath{\cup}}
Note that the ones marked “override” are supported, but not in math mode; my redefinitions make them work in both text and math mode.

Also note that given these definitions, U+03A3 GREEK CAPITAL LETTER SIGMA is typeset as a capital sigma Σ, whereas U+2211 N-ARY SUMMATION is typeset as a summation sign ∑, and similarly for capital pi and product symbols. Mac users should note that the standard option-shift-W and option-shift-P keystrokes produce the sum and product symbols, not Greek letters. Furthermore, the letter definitions, which use math mode, are probably not suitable for actually presenting Greek text, which I know nothing about.

14 Mathematics

[TODO: more to go here]

the AMS Short Math Guide and amsmath user’s guide.

\left and \right
\not to negate a following symbol

\DeclareMathOperator
[TODO: Column def in matrices: http://texblog.net/latex-archive/maths/amsmath-matrix/]
\operatorname{...} displays the parameter as a textual operator name (like sin, cos, etc.). \mathrel{...} does the same for a relational operator (like ≤), and \mathbin{...} for a “regular” binary operator like +.
\operatornamewithlimits \mid = \mathrel | 

[TODO: more to go here]

The subtle way to get right-aligned labels using extra alignment tabs.
\text vs. \textit

If you need to write your own variation depending on the math style, use
\mathchoice{display result}{inline text result}{superscript}{double superscript}

15 Useful packages

Most of these packages are distributed with TeX Live. Each package name is linked to its page on CTAN (if present) providing further information, documentation, and download.

[TODO: more to go here] other packages

15.1 array

Some guides to tabular formatting mention m and b column types which don’t work by default. This package enables/provides them. [TODO: more to go here]

15.2 amsmath

15.3 amssymb

15.4 changepage

[TODO: more to go here] “Change the page layout in the middle of a document”
15.5 \texttt{dcolumn}

[TODO: more to go here] Provides tabular columns aligned on decimal points.

15.6 \texttt{fancyvrb}

15.7 \texttt{fullpage}

[TODO: more to go here] Use normal-ish page margins rather than the narrow ones L\TeX{} defaults to.

15.8 \texttt{geometry}

[TODO: more to go here] Easily customize page margins. Can allegedly be used on a per-page basis but I have an old version.

15.9 \texttt{graphicx}

15.10 \texttt{inputenc}

See section \texttt{[13]}

15.11 \texttt{kbordermatrix}

Not part of CTAN or \TeX{} Live.

The \texttt{kbordermatrix} package by Kim C. Border provides matrices with cells outside the matrix for row and column labels.

15.12 \texttt{longtable}

[TODO: more to go here] Tables which can break across pages.

15.13 \texttt{multicol}

15.14 \texttt{multirow}

15.15 \texttt{rotating}

15.16 \texttt{textcomp}

Provides better versions of many symbols. Is implicitly used by \texttt{upquote}

15.17 \texttt{upquote}

\LaTeX{} tends to assume that certain ASCII-isms such as the straight quote are abominations not to be tolerated. This can have the unfortunate consequence of making your source code's strings look 'like this'. Using the \texttt{upquote} package will fix this, resulting in 'this' instead inside of "verbatim" (but not texttt).

15.18 \texttt{verbatim}

[TODO: more to go here] Provides \verbatiminput.

15.19 \texttt{wrapfig}

\begin{wrapfigure}{r}{0.3\textwidth}
\includegraphics[width=0.3\textwidth]{circuits}
\caption{Some caption.}
\label{somelabel}
\end{wrapfigure}

Note - if the wrapfig is taller than the page text (there is white space at the bottom of the page) then...
16 Useful definitions

[TODO: explain]

\newcommand{\unit}[1]{\ensuremath{\, \mathrm{#1}}}
\newcommand{\abs}[1]{\left\lvert #1 \right\rvert}
\newcommand{\mat}[1]{\begin{bmatrix} #1 \end{bmatrix}}
\newcommand{\augmat}[2]{\left[\begin{array}{*{#1}{c}|*{10}c}#2\end{array}\right]}
\newcommand{\detmat}[1]{\abs{\begin{matrix} #1 \end{matrix}}}
\newcommand{\avec}[1]{{\renewcommand{\\}{, } \left\langle #1 \right\rangle}}
\newcommand{\valigntop}[1]{\hskip0pt \vtop{\hbox{}
\vspace{-1em}
\hbox{#1}}} % makes a box's top align with the top of the text line in which it sits
\newcommand{\itemtag}[1]{\tag*{\llap{{#1}\hspace{5pt}}}} % requires leqno

17 Reference material

[TODO: amsshort, amsmath, lshort, comprehensive symbols list]

18 The source of this document

% Kevin Reid's guide to LaTeX
% % If you were hoping for a formatted document and got this instead, use the specific URL
% \documentclass{article}
% \usepackage[utf8]{inputenc}
% \usepackage{verbatim,upquote,multicol,datetime}
% \usepackage{tocloft} % provides \cftpagenumbersoff
% \usepackage{hyperref}
% \usepackage[paperheight=140in,paperwidth=8.5in,inner=0.4in,outer=3in,marginparwidth=2.7in,vmargin=0.8in]{geometry}
% \usepackage[hmargin=1in,vmargin=0.8in]{geometry}
% \newcommand{\packname}[1]{\href{http://tug.ctan.org/cgi-bin/ctanPackageInformation.py?id=#1}{\texttt{#1}}}
% \newcommand{\envname}[1]{\texttt{#1}} % TODO: find how to make a \tt backslash
% \newcommand{\cmdname}[1]{\textbackslash\texttt{#1}} % TODO: find how to make a \tt backslash
% \newenvironment{inlinetable}{\begin{center}}{\end{center}}
% \newcommand{\XXX}[1]{\textbf{\[TODO: #1\]}}
% \begin{document}
% \maketitle
% \section{Draft disclaimer}
% This document as you see it now is both incomplete and in need of fact-checking. It is currently published only because I think
% \vspace{2em} % XXX get these spacing tweaks more cleanly
% \begin{multicols}{2}
% \tableofcontents
% \end{multicols}
% \begin{document}
% \maketitle
% \section{Draft disclaimer}
% This document as you see it now is both incomplete and in need of fact-checking. It is currently published only because I think
% \vspace{2em} % XXX get these spacing tweaks more cleanly
% \begin{multicols}{2}
% \tableofcontents
% \end{multicols}
This is intended to serve as a quick-start tutorial for \LaTeX{}, assuming you're somewhat familiar with HTML or markup in general.

I am \textbf{not} a \LaTeX{} expert; this is purely compiled from my own "get this working" research. However, I hope it will be useful to those who are just starting out.

Please note that even though this is not a HTML document, it does contain hyperlinks. Furthermore, the page size has been set to 100% width, and therefore this document is not suitable for printing without modification.

\section{Software}

I currently use \url{http://tug.org/texlive/} \LaTeX{} installed though \url{http://www.macports.org/} MacPorts, and \url{http://macromates.com/} TextMate for editing/preview.

\section{Fundamentals}

\LaTeX{} originated as a macro package for \TeX{}. As a consequence, the features of \LaTeX{} are defined in terms of \TeX{}, and there are some elements of \TeX{} which are deprecated for ordinary use in \LaTeX{}.

\XXX[talk about the antitypewriterness and imperativeness of \LaTeX{}]

\section{Core syntax and semantics}

\subsection{Lexical structure}

Much like HTML, runs of whitespace are presented as a single space. (Furthermore, \LaTeX{}'s model tends to treating space as a flexible gap rather than as an ordinary character, so as to well support justification.)

The following characters or sequences of characters are special.

\begin{inlinetable}
\begin{tabular}{cp{15em}c}
\hline
Character & Purpose & Escaped \\
\hline
\& & name a command & \verb!\&!  \\
\$ & math mode & \verb!\$! \\
\{ & begin group & \verb!\{!  \\
\} & end group & \verb!\}! \\
\% & comment to end of line & \verb!\%!  \\
{} & begin optional argument (only after a command) & \verb!{}!  \\
{-} & & \verb!{-}! \\
\# & macro argument & \verb!\#!  \\
\textasciicircum & math superscript & \verb!\textasciicircum! or \verb!\^{}! \\
\_ & math subscript & \verb!\_!  \\
\textasciitilde & non-breaking space & \verb!\textasciitilde! or \verb!\~{}!  \\
\- & en dash & \verb!\-{}-!  \\
\- & em dash & \verb!\-{}-{}-!  \\
\end{tabular}
\end{inlinetable}

In addition to the given escapes, all of these can be escaped using the \texttt{verbatim} command, which is \verb!\verb!, an arbitrary delimiter.

\subsection{Syntactic structure}

It is useful to understand that \TeX{} is an \textbf{imperative macro-substitution} system. It is usually not necessary to explicitly use the imperative nature, but it may be useful in debugging.

There are two forms of nested structure: \texttt{groups} and \texttt{environments}.

A group is delimited by \verb!{...}!. Groups are most often used to surround arguments. Without a group, the \texttt{next single command} will be combined with the \emph{next} surrounding argument delimiters.

Environments are typically (but not necessarily) used for structure which spans many paragraphs. An environment is delimited by \verb!\begin{...}\end{...}!; thus it is very much like a HTML/SGML/XML element.
Many commands take one or more required arguments; each one of these is usually a {} block but need not be. For example, \verb!\frac12! is equivalent to \verb!\frac{1}{2}!.

Optional arguments are enclosed in [...]

\subsection{Lists}

\XXX[List types: \texttt{enumerate}, \texttt{itemize}, and \texttt{description}]

\subsection{Labels and references}

\subsection{Footnotes}

Writing a footnote is usually simple: put \verb!\footnote{Text of footnote goes here.}! at the place where you wish the footnote number to appear. There are some situations in which this will not work, such as inside a math environment \XXX[confirm this]. In this case, you can...

\subsection{Tables}

\subsection{Quotations and monospace}

The \texttt{quote} environment is precisely analogous to HTML \texttt{blockquote}.

The \texttt{verbatim} environment is analogous to HTML \texttt{pre}, except that it disables \LaTeX{} interpretation of the contents.

\XXX[Old note: \cmdname{ttstyle} (check) is like \texttt{<>}]

\subsection{Page and column breaks}

\XXX[\cmdname{pagebreak} \cmdname{columnbreak}]

\section{Layout model}

\XXX

\begin{verbatim}
\texttt{kpreid: What is vtop?}
\texttt{|Zz|: it creates a vertical box, by stacking a set of horizontal boxes, and the resulting vertical box has its baseline coincident with the first hbox}
\texttt{|Zz|: unlike \texttt{vbox}, which does the same but the final box has its baseline coincident with the last hbox}
\texttt{|Zz|: you also have \texttt{vcenter}, which has the final baseline at the center of the resulting vertical box, but it is only allowed in math mode}

Paragraphs can be put in the margin using \texttt{marginpar(bla bla)}. http://www.f.kth.se/~ante/latex.php

\texttt{rlap(foo) outputs foo, then backs up the width of foo. Example aligned linear system:}
\begin{verbatim}
\texttt{x_1 + 2x_2 + 3x_3 &= b_1} \\
5x_1 - \texttt{$\phantom{1}x_2$} &= b_2 \\
7x_1 + 3x_2 + 5x_3 &= b_3
\end{verbatim}

Better way to do a linear system (this goes inside a math env):
\begin{verbatim}
\begin{alignedat}{3}
x_1 &+ &2x_2 &+ &3x_3 &= b_1 \\
5x_1 &- &x_2 &{}& &= b_2 \\
7x_1 &+ &3x_2 &+ &5x_3 &= b_3
\end{alignedat}
\end{verbatim}
\end{verbatim}

\section{Packages}

\XXX

\section{Defining commands}

\XXX[rewrite this text]
\texttt{providecommand!} defines a command if it does not exist.
\texttt{newcommand!} defines a command, requiring that it does not exist.
\texttt{renewcommand!} overwrites an existing command. This is used to (a) change the behavior of a package, or (b) uniformly change...

\XXX[defining environments]
LaTeX{} assumes ASCII input by default. To permit using UTF-8 input, add to the preamble
\begin{quote}
\begin{verbatim}
\usepackage[utf8]{inputenc}
\end{verbatim}
\end{quote}
This enables interpreting the input as UTF-8; however, rendering Unicode characters is a separate issue. By default, a small set of Unicode characters is understood; others will be reported as errors. I do not know what the exact set is.

It is possible to extend the understood Unicode characters using the \begin{verbatim}!DeclareUnicodeCharacter! command. Here is a list of some useful declarations:

I may well be missing some standard way to obtain definitions like these; if so, let me know!

\begin{verbatim}
\DeclareUnicodeCharacter{00AC}{\ifmmode \lnot \else \textlnot \fi} % override
\DeclareUnicodeCharacter{00B0}{\ifmmode ^{\circ} \else \textdegree \fi} % override
\DeclareUnicodeCharacter{00B1}{\ensuremath{\pm}}
\DeclareUnicodeCharacter{00B5}{\mu}
\DeclareUnicodeCharacter{00B7}{\ifmmode \cdot \else \textperiodcentered \fi} % override
\DeclareUnicodeCharacter{00D7}{\ifmmode \times \else \texttimes \fi} % override
\DeclareUnicodeCharacter{00F7}{\ifmmode \div \else \textdiv \fi} % override
\DeclareUnicodeCharacter{0393}{\ensuremath{\Gamma}}
\DeclareUnicodeCharacter{0394}{\ensuremath{\Delta}}
\DeclareUnicodeCharacter{0398}{\ensuremath{\Theta}}
\DeclareUnicodeCharacter{03A3}{\ensuremath{\Sigma}}
\DeclareUnicodeCharacter{03A9}{\ensuremath{\Omega}}
\DeclareUnicodeCharacter{03B1}{\ensuremath{\alpha}}
\DeclareUnicodeCharacter{03B2}{\ensuremath{\beta}}
\DeclareUnicodeCharacter{03B3}{\ensuremath{\gamma}}
\DeclareUnicodeCharacter{03B4}{\ensuremath{\delta}}
\DeclareUnicodeCharacter{03B5}{\ensuremath{\epsilon}}
\DeclareUnicodeCharacter{03B8}{\ensuremath{\theta}}
\DeclareUnicodeCharacter{03BB}{\ensuremath{\lambda}}
\DeclareUnicodeCharacter{03C0}{\ensuremath{\pi}}
\DeclareUnicodeCharacter{03C1}{\ensuremath{\rho}}
\DeclareUnicodeCharacter{03C3}{\ensuremath{\sigma}}
\DeclareUnicodeCharacter{03C5}{\ensuremath{\phi}}
\DeclareUnicodeCharacter{03C9}{\ensuremath{\omega}}
\DeclareUnicodeCharacter{2080}{\ensuremath{\_0}}
\DeclareUnicodeCharacter{2081}{\ensuremath{\_1}}
\DeclareUnicodeCharacter{2082}{\ensuremath{\_2}}
\DeclareUnicodeCharacter{2083}{\ensuremath{\_3}}
\DeclareUnicodeCharacter{2084}{\ensuremath{\_4}}
\DeclareUnicodeCharacter{2085}{\ensuremath{\_5}}
\DeclareUnicodeCharacter{2086}{\ensuremath{\_6}}
\DeclareUnicodeCharacter{2087}{\ensuremath{\_7}}
\DeclareUnicodeCharacter{2088}{\ensuremath{\_8}}
\DeclareUnicodeCharacter{2089}{\ensuremath{\_9}}
\DeclareUnicodeCharacter{208A}{\ensuremath{\_+}}
\DeclareUnicodeCharacter{208B}{\ensuremath{\_-}}
\DeclareUnicodeCharacter{208C}{\ensuremath{\_=}}
\DeclareUnicodeCharacter{208D}{\ensuremath{\_\)}}
\DeclareUnicodeCharacter{208E}{\ensuremath{\_\)}}
\DeclareUnicodeCharacter{2190}{\ifmmode \leftarrow \else \textleftarrow \fi} % override
\DeclareUnicodeCharacter{2191}{\ifmmode \uparrow \else \textuparrow \fi} % override
\DeclareUnicodeCharacter{2192}{\ifmmode \rightarrow \else \textrightarrow \fi} % override
\DeclareUnicodeCharacter{2193}{\ifmmode \downarrow \else \textdownarrow \fi} % override
\DeclareUnicodeCharacter{21D0}{\ensuremath{\text{Leftarrow}}}
\DeclareUnicodeCharacter{21D2}{\ensuremath{\Rightarrow}}
\DeclareUnicodeCharacter{21D4}{\ensuremath{\Lefttrightarrow}}
\DeclareUnicodeCharacter{2200}{\ensuremath{\forall}}
\DeclareUnicodeCharacter{2203}{\ensuremath{\exists}}
\DeclareUnicodeCharacter{2205}{\ensuremath{\varnothing}}
\DeclareUnicodeCharacter{2212}{\ensuremath{\Delta}}
\DeclareUnicodeCharacter{2218}{\ensuremath{\in}}
\end{verbatim}
\end{quote}
\section{Mathematics}

\XXX

\verb!\left and \right!
\verb!\not! to negate a following symbol
\verb!\DeclareMathOperator!

\XXX[Column defs in matrices: http://texblog.net/latex-archive/maths/amsmath-matrix/]
\verb!\operatorname{...}! displays the parameter as a textual operator name (like \sin, \cos, etc.). \verb!\mathrel{...}! does the same for a relational operator (like $\le$), and \verb!\mathbin{...}! for a regular binary operator like $+$.\verb!\operatornamewithlimits!\verb!\mid! = \verb!\mathrel |!

\XXX
\begin{verbatim}
The subtle way to get right-aligned labels using extra alignment tabs.
\text vs. \texttt
If you need to write your own variation depending on the math style, use
\texttt{\mathchoice{display result}{inline text result}{superscript}{double superscript}}
\end{verbatim}

\section{Useful packages}

Most of these packages are distributed with \TeX{} Live. Each package name is linked to its page on CTAN (if present) providing further information, documentation, and download.

\XXX other packages
\packsubsection{array}

Some guides to tabular formatting mention \m and \b column types which don’t work by default. This package enables/provides them.

\packsubsection{amsmath}
\packsubsection{amssymb}
\packsubsection{changepage}
\XXX \Change the page layout in the middle of a document"

\packsubsection{dcolumn}
\XXX Provides tabular columns aligned on decimal points.

\packsubsection{fancyvrb}
\packsubsection{fullpage}
\XXX Use normal-ish page margins rather than the narrow ones \LaTeX{}\ defaults to.

\packsubsection{geometry}
\XXX Easily customize page margins. Can allegedly be used on a per-page basis but I have an old version.

\packsubsection{graphicx}
% skipping ifpdf
\packsubsection{inputenc}
See section \ref{unicode}.

\subsection{kbordermatrix}
\label{kbordermatrix}
Not part of CTAN or \TeX{}\ Live.

The \verb|\href{http://www.hss.caltech.edu/~kcb/TeX/}{\texttt{kbordermatrix}}| package by Kim C. Border provides matrices with cells outside the matrix for row and column labels.

\packsubsection{longtable}
\XXX Tables which can break across pages.

\packsubsection{multicol}
\packsubsection{multirow}
\packsubsection{rotating}
\packsubsection{textcomp}
Provides better versions of many symbols. Is implicitly used by \packname{upquote}.

\packsubsection{upquote}
\LaTeX{}\ tends to assume that certain ASCII-isms such as the straight quote are abominations not to be tolerated. This can have
\%
2010-09-08 I hear from Sam Peyson at COSI that vaucanson-g is a package for laying out finite state diagrams. But that's too specialized to list here.

\packsubsection{verbatim}
\XXX Provides \verb|!\verbatiminput|!.

\packsubsection{wrapfig}
\begin{verbatim}
\begin{wrapfigure}{r}{0.3\textwidth}
\includegraphics[width=0.3\textwidth]{circuits}
\caption{Some caption.}
\label{somelabel}
\end{wrapfigure}
\end{verbatim}
Note - if the wrapfig is taller than the page text (there is white space at the bottom of the page) then its text-clearing will
\end{verbatim}
\section{Useful definitions}
\XXX[explain]
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