

$\mathcal{M}\mathcal{S}$ - $\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ Reference Card #1

See the $\mathcal{T}\mathcal{E}\mathcal{X}$ Reference Card for additional commands.

Required packages are indicated as (package).

Document Structure

• Preamble

```
\documentclass[option(s)]{class}  
\usepackage[option(s)]{package(s)}  
\begin{document}
```

• Body

- **Front Matter** (`\frontmatter` in book classes)
 - **Top Matter**
 - `\title{...}`
 - `\title[running head]{...}` alternative headline
 - `\date{...}`
 - `\date{\today}` gives current date
 - `\author{...}`
 - `\maketitle` (not in book classes)
 - **Additional items — ams classes only**
 - `\translator{...}`
 - `\dedicatory{...}`
 - `\address[optional name]{...}`
 - `\curaddress{...}`
 - `\email[optional name]{...}`
 - `\thanks{...}`
 - `\subjclass{Primary: XXX; Secondary: XXX}`
 - `\keywords{...}`
 - `\thanks{...}`
 - `\tableofcontents`
 - `\chapter{Introduction}` (in book classes)
- **Abstract** (not in book classes)
 - `\begin{abstract}... \end{abstract}`
- **Main Matter** (`\mainmatter` in book classes)
 - `\chapter{...}`
 - `\section{...}`
 - `\subsection{...}`
 - `\appendix`
- **Back Matter** (`\backmatter` in book classes)
 - `\begin{thebibliography}{99}... \end{...}`

```
\end{document}
```

Page Style

```
\pagestyle{style} set page style to one of:  
plain          empty header, page number in footer  
empty          empty header and footer  
headings       header filled by doc class, empty footer  
myheadings     empty footer, fill header with info in  
                \markboth{lefthead}{righthead}  
                and \markright{righthead}
```

```
\thispagestyle{style} set \pagestyle, only current page  
\enlargethispage{\baselineskip} force an extra line  
\renewcommand{\baselinestretch}{2} doublespaced
```

`fancyheadings` package allows custom headers and footers

• Page Style Parameters

```
\hoffset, \voffset move page right, down  
\paperwidth, \paperheight, \textheight, \textwidth  
\topmargin, \headheight, \headsep, \footskip  
\pagenumbering{...} e.g., arabic, roman
```

Classes and Packages

```
\documentclass[option(s)]{class}  
\usepackage[option(s)]{package(s)}  
\NeedsTeXFormat{LaTeX2e}[1994/12/01]
```

• Document Classes

`article`, `book`, `letter`, `report`, `slides`
`amsart`, `amsbook`, `amsproc` (all autoload `amsmath`)

• Useful Packages

`amsmath`, `amsthm`, `amscd`, `amssymb`, `latexsym`
`fancyheadings` allows custom headers and footers
`alltt` all teletype, even `\,{\,}`
`makeidx`, `showidx` create index, show in margin
`graphics`, `graphicx` inclusion of graphics
`enumerate` extends the `enumerate` environment
`layout` shows page layout of doc class
`multicol` flexible multicolumn typesetting
`showkeys` print label keys in margin
`verbatim` extends `verbatim` environment
`url` typeset URLs allowing line breaks
`graphpap` `\graphpaper` command for `\picture` environ.

• Document and Package Options

Font Size

`8pt`, `9pt`, `10pt`, `11pt`, `12pt`

Paper Size

`a4paper`, `a5paper`, `b5paper`, `legalpaper`, `letterpaper`

Document Preparation

`draft`, `final`, `notitlepage`, `titlepage`

Page Formatting

`onecolumn`, `twocolumn`, `oneside`, `twoside`, `openany`, `openright`

Equation Numbering

`fleqn`, `leqno`, `reqno`, `centertags`, `tbtags`

Equation Limits

`intlimits`, `sumlimits`, `nonamlimits`

AMS (Postscript) Fonts

`psamsfonts`, `noamsfonts`

Bibliography (see also $\mathcal{B}\mathcal{I}\mathcal{B}\mathcal{T}\mathcal{E}\mathcal{X}$)

```
\begin{thebibliography}{99}... \end{...}  
bibliography with widest label specified  
\bibitem{name} named bibliography item  
\bibitem[label]{name} with alternative label to print  
\bysame use long line for same author  
\renewcommand{\bibname}{title} use custom title  
\cite{name} print number of named bib item  
\cite[text]{name} with extra text
```

Cross Referencing and Numbering

```
\label{name} assign label name to numbered item  
\ref{name} print number of named item  
\eqref{name} print number in parentheses (amsmath)  
\pageref{name} print page location of named item  
\cite{name} print number of named bibliography item  
\cite[text]{name} with extra text  
\numberwithinsection{equation}{section} number by section
```

Sectioning and Table of Contents

• Sectioning commands

<code>\command{title}</code>	sectioning command with title	
<code>\command[head]{title}</code>	with alternative running head	
<code>\command*{title}</code>	with number suppressed	
<code>\part</code>	<code>\section</code>	<code>\paragraph</code>
<code>\chapter</code>	<code>\subsection</code>	<code>\subparagraph</code>
	<code>\subsubsection</code>	
<code>\appendix</code>	start appendix	

• Table of Contents

<code>\tableofcontents</code>	create and print contents
<code>filename.toc</code>	contents associated to <code>filename.tex</code>
<code>\addcontentsline{toc}{section}{line to add}</code>	
<code>\addtocontents{toc}{material to add}</code>	
<code>\setcounter{tocdepth}{...}</code>	set amount to print

Tables and Figures

<code>\begin{table} ... \caption{text} \label{name} \end{table}</code>	
<code>\listoftables</code>	create and print list of tables
<code>\begin{figure} ... \caption{text} \label{name} \end{figure}</code>	
<code>\includegraphics{filename}</code>	include image (graphics)
<code>\scaledbox{.5}{\includegraphics{filename}}</code>	scaled graphic
<code>\listoffigures</code>	create and print list of figures

Lists

<code>\item</code>	item within list
<code>\item[label]</code>	item with label
<code>\begin{enumerate}... \end{...}</code>	numbered items
<code>\begin{itemize}... \end{...}</code>	bulleted items
<code>\begin{description}... \end{...}</code>	captioned items
<code>\setlength{itemsep}{0pt}</code>	move items closer
enumerate package	extends <code>enumerate</code>

Displayed Text Material

<code>\begin{center}... \end{...}</code>	centered material
<code>\begin{flushright}... \end{...}</code>	flush right material
<code>\begin{flushleft}... \end{...}</code>	flush left material
<code>\begin{quote}... \end{...}</code>	short quote
<code>\begin{quotation}... \end{...}</code>	long quote
<code>\begin{verse}... \end{...}</code>	poetry
<code>\begin{verbatim}... \end{...}</code>	verbatim material
<code>\verb ... </code>	verbatim material
<code>\verb* ... </code>	verbatim with spaces marked
verbatim package	extends <code>verbatim</code>

Footnotes, Comments, Other Stuff

<code>\footnote{text}</code>	numbered footnote
<code>%</code>	comment out a line
<code>\begin{comment}... \end{...}</code>	long comment (verbatim)
<code>\typeout{text}</code>	print to terminal
<code>\typein{text}</code>	get input from keyboard
<code>\typein[cmd]{text}</code>	assign input to <code>cmd</code>
<code>\protect</code>	protects fragile commands
<code>\-</code>	optional hyphen
<code>\hyphenation{hyphenated words}</code>	extra hyphenated words

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Dimensions, Spacing, and Glue

Dimensions are specified as `<number><unit of measure>`.

Glue is specified as `<dimen> plus<dimen> minus<dimen>`.

point	pt	pica	pc	inch	in	centimeter	cm
m width	em	x height	ex	math unit	mu	millimeter	mm
1 pc	= 12 pt	1 in	= 72.72 pt	2.54 cm	= 1 in	18 mu	= 1 em

<code>\quad</code>	<code>\qqquad</code>	white space (1 space, 1 em, 2 em)
<code>\hspace{10pt}</code>		specified horizontal space
<code>\hspace*{10pt}</code>		space even at line start
Horizontal Spacing (Math): <code>\</code> , thin space <code>\:</code> med space		
<code>\;</code>	thick space	<code>\!</code> neg. thin space <code>\mspace{muglue}</code>

<code>\strut, \mathstrut</code>	invisible vertical space
<code></code>	invisible space
<code>\vphantom{...}</code>	invisible vertical space
<code>\smash[bt]{...}</code>	typeset w/zero height, depth
<code>\hfill</code>	fill with space
<code>\dotfill</code>	fill with dots
<code>\hrulefill</code>	fill with rule (line)
<code>\par</code>	new paragraph
<code>\newline</code> or <code>\\</code>	force a new line
<code>*</code>	new line, prohibit page break
<code>\\[5pt]</code>	new line skipping 5 pts
<code>\vspace{1in}</code>	specified vertical space
<code>\vspace*{1in}</code>	space even at page start
<code>\newpage</code>	force a new page

• Length Variables

<code>\newlength{<length>}</code>	create length variable <code>\length</code>
<code>\setlength{<length>}{<dimen>}</code>	set value of <code>\length</code>
<code>\addtolength{<length>}{<dimen>}</code>	increase <code>\length</code>

• Useful Length Assignments

<code>\enlargethispage{<baselineskip>}</code>	force extra line
<code>\setlength{<hangindent>}{30pt}</code>	indentation
<code>\setlength{<hangafter>}{3}</code>	indent after
<code>\renewcommand{<baselinestretch>}{2}</code>	doublespaced

Accents

Type	Example	In Math	In Text
hat	\hat{a}	<code>\hat</code>	<code>\^</code>
expanding hat	\widehat{abc}	<code>\widehat</code>	none
check	\check{a}	<code>\check</code>	<code>\v</code>
tilde	\tilde{a}	<code>\tilde</code>	<code>\~</code>
expanding tilde	\widetilde{abc}	<code>\widetilde</code>	none
acute	\acute{a}	<code>\acute</code>	<code>\'</code>
grave	\grave{a}	<code>\grave</code>	<code>\`</code>
dot	\dot{a}	<code>\dot</code>	<code>\.</code>
double dot	\ddot{a}	<code>\ddot</code>	<code>\"</code>
breve	\breve{a}	<code>\breve</code>	<code>\u</code>
bar	\bar{a}	<code>\bar</code>	<code>\=</code>
vector	\vec{a}	<code>\vec</code>	none
cedilla	\S	none	<code>\c</code>

Additional Text Symbols

<code>\dag</code>	†	<code>\copyright</code>	©	<code>\pounds</code>	£
<code>\ddag</code>	‡	<code>\textcircled{r}</code>	⒓		
<code>\P</code>	¶	<code>\textvisiblespace</code>	␣		
<code>\S</code>	§	<code>\textbullet</code>	•		

Fonts

• Text Fonts

`\textnormal{...}` `{\normalfont...}` document font
`\textrm{...}` `{\rmfamily...}` roman
`\textsf{...}` `{\sffamily...}` sans serif font
`\texttt{...}` `{\ttfamily...}` typewriter style
`\textbf{...}` `{\bfseries...}` **bold**
`\textup{...}` `{\upshape...}` upright
`\textit{...}` `{\itshape...}` *italic*
`\textsl{...}` `{\slshape...}` *slanted*
`\textsc{...}` `{\scshape...}` SMALL CAPITALS
`\emph{...}` `{\em...}` *emphasize*
`\fbox{...}` framed text

• Font Environments exist for above types, e.g.,

`\begin{ttfamily}... \end{...}`

• Changing Font Sizes

`\tiny`, `\scriptsize`, `\footnotesize`, `\small`
`\normalsize`, `\large`, `\Large`, `\LARGE`, `\huge`, `\Huge`

• Math Fonts

`\mathrm{...}` roman
`\mathbf{...}` **bold** (letters)
`\boldsymbol{...}` **bold** (symbol) (amsmath)
`\mathit{...}` *italic*
`\mathcal{...}` calligraphic *A, B, C*
`\usepackage{eucal}` redefine `\mathcal` to script *A, B, C*
`\mathfrak{...}` Fraktur *A, a, B, b* (amsfonts)
`\mathbb{...}` Blackboard bold *A, B, C* (amsfonts)
`\boxed{...}` framed math

• Math Font Sizes

`\displaystyle` display size
`\textstyle` text size
`\scriptsize` sub/superscript size
`\scriptscriptsize` doubly sub/superscripted size

Boxes

`\mbox{...}` one line of text
`\text{...}` one line of text (amsmath)
`\parbox{width}{text}` paragraph of text
`\parbox[align][height][inner align]{width}{text}`
`\marginpar{...}` marginal comment
`\rule[-1pt]{20pt}{10pt}` solid box
`\raisebox{5pt}{text}` raised box
`\makebox[width][alignment]{text}` box of text
`\framebox[width][alignment]{text}` framed text
`\setlength{\fboxsep}{5pt}` space around text
`\setlength{\fboxrule}{3pt}` width of box borders

Overfull and Underfull Boxes

`draft` document class marks overfulls
`\overfullrule` width of overfull marker
`\begin{setlength}{\hfuzz}{2pt}... \end{...}`
allow small overfulls

Multicolumn Printing

`\twocolumn` double column on new page
`\onecolumn` single column on new page
`\begin{multicols}{n}[title]... \end{...}`
multicolumn environment (`multicol`)

Array and Tabular Environments

`\begin{tabular}[POS]{COLS}... \end{...}`
`\begin{array}[POS]{COLS}... \end{...}`
Use `tabular` for text, `array` for mathematics
`&`, `\` column and row separators
POS aligns top (t), bottom (b), center (default)
COLS gives formats for columns:
`l, c, r` left, center, right justified
`|` vertical rule
`@{...}` material between columns
`@{}` no space between columns
`*{n}{...}` *n* copies of material
`p{width}` set column width
`\hline` horizontal line between rows
`\cline{i-j}` line across columns *i* to *j*
`\multicolumn{n}{COLS}{...}`

span *n* columns using format in COLS

`\setlength{\tabcolsep}{0pt}` set column separation
`\setlength{\itemsep}{0pt}` set item separation
`\renewcommand{\arraystretch}{1.25}` open up array

• Example of a table using `\tabular`

```

\begin{table}
  \begin{center}
    \begin{tabular}{|l|c|c|} \hline
      Name & Exam & Grade \\ \hline
      Dan & 97% & A \\ \hline
    \end{tabular}
    \caption{Math 101 Final Grades}
    \label{GradeTable}
  \end{center}
\end{table}

```

Name	Exam	Grade
Dan	97%	A

Math 101 Final Grades

Tabbing Environment

`\begin{tabbing}... \end{...}` tabbing environment
`\=` set tab
`\` end line
`\>` move to next tab
`\kill` do not print line

File Suffixes and Types

• L^AT_EX Source Files

`.tex` File containing a L^AT_EX document
`.sty`, `.cls` L^AT_EX style and document class files
`.fd` Font definition file

• Files Written by L^AT_EX

(See also BIB_TE_X and MAKEINDEX)
`.aux` cross-referencing and list information
`.dvi` device independent typeset file
`.glo` list of glossary entries
`.lof` list of figures (read by `\listoffigures`)
`.lot` list of tables (read by `\listoftables`)
`.toc` table of contents (read by `\tableofcontents`)
`.log` L^AT_EX log file
`\nofiles` suppresses all except `.log` and `.dvi`

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\mathcal{A}_M S-L^AT_EX Reference Card #2

See the T_EX Reference Card for additional commands.
The notation (**package**) indicates a required package.

Math Environments

<code>\(...\)</code> or <code>\$\$\$</code>	inline math
<code>\[...\]</code> or <code>\$\$\$\$</code>	displayed math
<code>\begin{equation}\label{eqname}...\end{...}</code>	numbered and labeled equation
<code>\ref{eqname}</code>	refer to labeled eqn
<code>\mbox{...}</code>	text in math
• The following require <code>amsmath</code>	
<code>\text{...}</code>	text in math
<code>\begin{equation*}...\end{...}</code>	unnumbered eqn
<code>\tag{eqtag}</code>	use eqtag instead of number
<code>\notag</code>	suppress equation tag
<code>\eqref{eqname}</code>	ref with parens
<code>\begin{subequations}...\end{...}</code>	group equations for numbering
<code>\numberwithin{equation}{section}</code>	number equations within sections

Theorems, Lemmas, Etc.

• Defining Theorem-Like Environments

<code>\newtheorem{name}{label}</code>	theorem environment
<code>\newtheorem*{name}{label}</code>	unnumbered (amsthm)
<code>\newtheorem{name}[other name]{label}</code>	numbered consecutively with other environment
<code>\newtheorem{name}{label}[section]</code>	numbered by section (or chapter , etc.)
<code>\swapnumbers</code>	put numbers on left
• Theorem-Like Environment Styles (amsthm)	
<code>\theoremstyle{plain}</code>	most emphatic
<code>\theoremstyle{definition}</code>	medium emphasis
<code>\theoremstyle{remark}</code>	least emphatic
• Invoking Theorem-Like Environments	
<code>\begin{name}... \end{...}</code>	invoke environment
<code>\begin{name}[label]...</code>	invoke with new label
If proclamation starts with a list, put in <code>\hfill</code>	
<code>\begin{proof}... \end{...}</code>	proof environment
<code>\begin{proof}[label]... \end{...}</code>	proof with label
<code>\qedsymbol</code>	end of proof marker
<code>\renewcommand{\qedsymbol}{...}</code>	redefine marker

Commutative Diagrams (amscd)

Separate lines with `\\`, do not use `&s`

<code>\begin{CD}... \end{CD}</code>	commutative diagram
<code>@>#1>#2></code>	right arrow with labels
<code>@<#1<#2<</code>	left arrow with labels
<code>@V#1V#2V</code>	down arrow with labels
<code>@A#1A#2A</code>	up arrow with labels
<code>@=</code>	long horizontal equal sign
<code>@ </code>	long vertical equal sign
<code>@.</code>	leave out an arrow

Multiline Math Displays (amsmath)

Use as `\begin{command}...\end{command}`
 Separate items with `&`, separate lines with `\\`
 No `\\` on last line, `\\[dim]` to skip space

- **Full Math Environments (full line)**

gather	centered, numbered equations
gather*	centered, unnumbered equations
multline	first line left, last line right, rest centered
multline*	same as multline, but unnumbered
align	formulas aligned at & signs
align*	same as align, but unnumbered
flalign	flush left and right align
alignat	align without space, needs argument \begin{alignat}{# of cols}
\intertext{text}	text between lines
\shoveleft,\shoveright	move multline line left, right
\allowdisplaybreaks	allow page breaks (\&* prohibits)
\displaybreak	force page break (before \&)
• Math Subenvironments (within math display)	
gathered	centered equations
aligned	formulas aligned at & signs
split	split long formula within other environment
cases	cases, with { on left
matrix	matrix (of up to 10 columns)
pmatrix, bmatrix, vmatrix, Vmatrix	matrix variants enclosed by (· · ·), [· · ·], · · · , · · ·
\setcounter{MaxMatrixCols}{12}	increase number of matrix columns
\hdotsfor{num}	dots across columns

Overlines, Underlines, and Arrows

<code>\underline{...}</code>	underline
<code>\overline{...}</code>	overline
<code>\overbrace{...}^{...}</code>	overbrace
<code>\underbrace{...}_{...}</code>	underbrace
<code>\overrightarrow{...}</code>	over right arrow
<code>\overleftarrow{...}</code>	over left arrow
<code>\overleftrightarrow{...}</code>	over left-right arrow
<code>\underrightarrow{...}, \underleftarrow{...}, etc.</code>	
<code>\xrightarrow[bot]{top}</code>	stretchable w/sub/supscripts
<code>\xleftarrow[bot]{top}</code>	stretchable w/sub/supscripts

Operator Names

<code>\arccos</code>	<code>\cos</code>	<code>\csc</code>	<code>\exp</code>	<code>\ker</code>	<code>\liminf</code>	<code>\min</code>	<code>\sinh</code>
<code>\arcsin</code>	<code>\cosh</code>	<code>\deg</code>	<code>\gcd</code>	<code>\lg</code>	<code>\limsup</code>	<code>\Pr</code>	<code>\sup</code>
<code>\arctan</code>	<code>\cot</code>	<code>\det</code>	<code>\hom</code>	<code>\lim</code>	<code>\log</code>	<code>\sec</code>	<code>\tan</code>
<code>\arg</code>	<code>\coth</code>	<code>\dim</code>	<code>\inf</code>	<code>\ln</code>	<code>\max</code>	<code>\sin</code>	<code>\tanh</code>
<code>a \equiv b \pmod{m}</code>	$a \equiv b \pmod{m}$						
<code>a \equiv b \mod{m}</code>	$a \equiv b \pmod{m}$						
<code>a \bmod m</code>	$a \bmod m$						
<code>\DeclareMathOperator{\langlecmd\rangle{opname}}</code>	create operator						
<code>\DeclareMathOperator*{\langlecmd\rangle{opname}}</code>	with limits						
<code>\operatorname{...}</code>	typeset as an operator						
<code>\operatornamename*{...}</code>	with limits						

Large Operators

\sum	<code>\sum</code>	\bigcap	<code>\bigcap</code>	\bigodot	<code>\bigodot</code>
\prod	<code>\prod</code>	\bigcup	<code>\bigcup</code>	\bigotimes	<code>\bigotimes</code>
\coprod	<code>\coprod</code>	\bigsqcup	<code>\bigsqcup</code>	\bigoplus	<code>\bigoplus</code>
\int	<code>\int</code>	\bigvee	<code>\bigvee</code>	\biguplus	<code>\biguplus</code>
\oint	<code>\oint</code>	\bigwedge	<code>\bigwedge</code>		
$\substack{xxx\\yyy}$	<code>\substack{xxx\\yyy}</code>				
\limits_{\dots}	<code>\limits_{\dots}</code>				
$\oint, \iint, \iiint, \iiint, \idotsint$	<code>\oint, \iint, \iiint, \iiint, \idotsint</code>				
					integral variants (amsmath)

Delimiters

$[$	<code>\lbrack</code> or <code>\l</code>	$\{$	<code>\lbrace</code> or <code>\{</code>	\langle	<code>\langle</code>
$]$	<code>\rbrack</code> or <code>\]</code>	$\}$	<code>\rbrace</code> or <code>\}</code>	\rangle	<code>\rangle</code>
$ $	<code>\vert</code> or <code>\lvert</code>	\lfloor	<code>\lfloor</code>	\lceil	<code>\lceil</code>
$\ $	<code>\Vert</code> or <code>\lVert</code>	\rfloor	<code>\rfloor</code>	\rceil	<code>\rceil</code>
\uparrow	<code>\uparrow</code>	\Uparrow	<code>\Uparrow</code>	\updownarrow	<code>\updownarrow</code>
\downarrow	<code>\downarrow</code>	\Downarrow	<code>\Downarrow</code>	\Updownarrow	<code>\Updownarrow</code>
$\left(\right)$	<code>\left(\right)</code>				
$\left. \right.$	<code>\left. \right.</code>				
$\bigl(\bigr)$	<code>\bigl(\bigr)</code>				
$\Bigl(\Bigr)$	<code>\Bigl(\Bigr)</code>				
$\biggl(\biggr)$	<code>\biggl(\biggr)</code>				
$\bigl \bigr $	<code>\bigl \bigr </code>				

Roots

$\sqrt{\dots}$	<code>\sqrt{\dots}</code>	square root $\sqrt{\dots}$
$\sqrt[n]{\dots}$	<code>\sqrt[n]{\dots}</code>	n th root $\sqrt[n]{\dots}$
$\leftroot{2}, \uproot{2}$	<code>\leftroot{2}, \uproot{2}</code>	move root left or up

Ellipses

\ldots	<code>\ldots</code>	ellipses
\vdots	<code>\vdots</code>	vertical and diagonal dots
$\dotsc, \dotsc, \dotsc, \dotsc$	<code>\dotsc, \dotsc, \dotsc, \dotsc</code>	more ellipses (amsmath)

Fractions and Stacked Relations

$\frac{n}{d}$	<code>\frac{n}{d}</code>	fraction $\frac{n}{d}$
$\dfrac{n}{d}$	<code>\dfrac{n}{d}</code>	displaystyle fraction
$\tfrac{n}{d}$	<code>\tfrac{n}{d}</code>	textstyle fraction
$\binom{n}{d}$	<code>\binom{n}{d}</code>	binomial coefficient $\binom{n}{d}$
$\genfrac{\ldelim}{\rdelim}{\thick}{\style}{\num}{\den}$	<code>\genfrac{\ldelim}{\rdelim}{\thick}{\style}{\num}{\den}</code>	
$\cfrac{\dots}{\dots}$	<code>\cfrac{\dots}{\dots}</code>	continued fraction
$\stackrel{\text{top}}{\text{bot}}$	<code>\stackrel{\text{top}}{\text{bot}}</code>	stacked relation
$\overset{\text{top}}{\text{bot}}$	<code>\overset{\text{top}}{\text{bot}}</code>	stacked symbol (amsmath)
$\underset{\text{bot}}{\text{top}}$	<code>\underset{\text{bot}}{\text{top}}</code>	stacked relation (amsmath)
$\sideset_{\text{ll}}^{\text{ul}}_{\text{lr}}{\text{ur}}{\text{largeop}}$	<code>\sideset_{\text{ll}}^{\text{ul}}_{\text{lr}}{\text{ur}}{\text{largeop}}</code>	large operator with left/right sub/supscripts

Negated Relations

\not	<code>\not</code>	negate a relation
\neq	<code>\neq</code>	not equal \neq
\notin	<code>\notin</code>	not a member of \notin
\nmid	<code>\nmid</code>	not divisible \nmid

User Defined Commands

$\newcommand{\name}{replacement text}$	<code>\newcommand{\name}{replacement text}</code>	new command
$\newcommand{\name}[n]{text with \#1, \#2, \dots, \#n}$	<code>\newcommand{\name}[n]{text with \#1, \#2, \dots, \#n}</code>	new command with n arguments
Example: $\newcommand{\vect}[2]{\#1_1, \ldots, \#1_{\#2}}$	<code>\newcommand{\vect}[2]{\#1_1, \ldots, \#1_{\#2}}</code>	
$\newcommand{\name}[n][default]{\dots}$	<code>\newcommand{\name}[n][default]{\dots}</code>	command with args and default value for $\#1$
$\renewcommand{\dots}{\dots}$	<code>\renewcommand{\dots}{\dots}</code>	redefine existing command
$\providecommand{\dots}{\dots}$	<code>\providecommand{\dots}{\dots}</code>	define if doesn't exist
$\newcommand*{\dots}{\dots}$	<code>\newcommand*{\dots}{\dots}</code>	command with one par arg
$\ensuremath{\dots}$	<code>\ensuremath{\dots}</code>	forces math mode
$\show\command$	<code>\show\command</code>	print definition of <code>\command</code>
$\showthe\paramname$	<code>\showthe\paramname</code>	print value of a parameter

User Defined Environments

$\newenvironment{\name}{pretext}{posttext}$	<code>\newenvironment{\name}{pretext}{posttext}</code>	new environment with material before and after
$\newenvironment[n]{\name}{\dots}{\dots}$	<code>\newenvironment[n]{\name}{\dots}{\dots}</code>	environment with n arguments
$\newenvironment[n][default]{\name}{\dots}{\dots}$	<code>\newenvironment[n][default]{\name}{\dots}{\dots}</code>	environment with default value for $\#1$
$\renewenvironment{\name}{\dots}{\dots}$	<code>\renewenvironment{\name}{\dots}{\dots}</code>	redefine envrment

MAKEINDEX

- **MakeIndex** File Suffixes
`.idx, .ind, .ilg` entry listing, index file, log file
- **MakeIndex** Commands in Document File
`\usepackage{makeidx}` use indexing package
(Do not include this line if using AMS packages.)
`\makeindex` tell L^AT_EX to create an `.idx` file
`\printindex` tell L^AT_EX to print index here
`\nofiles` suppresses creation of `.idx` and `.glo` files
- Creating **MakeIndex** `.idx` File
`\index{entry}` main entry
`\index{entry!entry}` subentry
`\index{entry!entry!entry}` subsubentry
`\index{text@entry}` with placement info
`\index{entry|see{entry}}` cross referenced entry
`\index{entry|modifier}` entry with page modifier
e.g. `\index{gnats|textbf}` give bold page number
`\index{entry|() \dots \index{entry|)}` page range
Special Characters: `" ! " @ " | " "`
- Creating An Index With **MakeIndex**
(1) Typeset document containing `\makeindex` command.
(2) Run MakeIndex on `.idx` file to create `.ind` file.
(3) Typeset document containing `\printindex` command.

Glossary

\makeglossary	<code>\makeglossary</code>	tell L ^A T _E X to create a <code>.glo</code> file
\glossary{entry}	<code>\glossary{entry}</code>	create a glossary entry
$\glossaryentry{entry}{page no.}$	<code>\glossaryentry{entry}{page no.}</code>	entries in <code>.glo</code> file
$\input filename.glo$	<code>\input filename.glo</code>	read glossary file
User must define <code>\makeglossary</code> , e.g., $\newcommand{\glossaryentry}[2]{\#1, page \#2\par}$	<code>\newcommand{\glossaryentry}[2]{\#1, page \#2\par}</code>	

Time and Date

\today	<code>\today</code>	current date
Use <code>\the</code> to display the following items		
$\day, \month, \year, \time$	<code>\day, \month, \year, \time</code>	(minutes since midnight)

Counters

`\newcounter{cnt}` create new counter named `cnt`
`\newcounter{cnt}[cnt1]` reset `cnt` when `cnt1` changes
`\setcounter{cnt}{value}` set value of `cnt`
`\stepcounter{cnt}` increment `cnt`
`\refstepcounter{cnt}` increment and reset `\label`
`\addtocounter{cnt}{n}` increment by n
`\value{cnt}` value stored in `cnt`
`\thecnt` the value of `cnt`
`calc` package to do counter arithmetic

• Counter Styles

`\arabic{}` `\roman{}` `\Roman{}` `\alph{}` `\Alph{}`

• Standard Counters

`equation` `footnote` `figure` `page` `table`
`part` `chapter` `section` `subsection` `subsubsection`
`paragraph` `subparagraph` `enumi` `enumii` `enumiii` `enumiv`
`secnumdepth` depth to which sections are numbered
`tocdepth` depth to which sections are put into `toc`

Customized List Environments

`\begin{list}{default label}{declarations}`
`\item` item 1 text
`\item` item 2 text
`\end{list}`
`\begin{trivlist}... \end{trivlist}`
list with no labels or declarations, trivial lengths

• Declarations

`\setlength{length parameter}{length}`

`\usecounter{counter name}`

[Create counter first using `\newcounter{counter name}`.]

• Length Parameters (see page 113 of Lamport for more)

`\topsep` separate preceding text and first item
`\itemsep` separate items
`\leftmargin` indent of item box from left margin
`\labelwidth` width of box for item label
`\labelsep` separate label box from item box

The picture Environment

`\begin{picture}(w,h)...\end{picture}` picture
`\begin{picture}(w,h)(\Delta x,\Delta y)...` with offset
`\put(x,y){picture object}` place object
`\multiput(x,y)(\Delta x,\Delta y){n}{object}` n times

Picture Objects:

`\makebox(x,y)[tblr]{text}` box with text
`\line(\Delta x,\Delta y){x length}` line of slope $\Delta y/\Delta x$
`\vector(\Delta x,\Delta y){x length}` arrow of slope $\Delta y/\Delta x$
`\circle{r}` circle of radius r
`\circle*{r}` filled circle
`\oval(x,y)[lrbt]` oval (part or whole)
`\shortstack{abc\backslash xyz\backslash}` stacked text
`\framebox(x,y)[tblr]{text}` framed text
`\frame{text},fbox{text}` other framed boxes
`\dashbox{d}(x,y){text}` dashed box
`\qbezier(x_1,y_1)(x_2,y_2)(x_3,y_3)` quadratic curve
`\savebox{name}(x,y){...}` store material
`\usebox{name}` retrieve material
`\graphpaper[n]{x,y}{w,h}` print grid (`graphpap`)
`\setlength{\unitlength}{1pt}` change size of picture
`\thinlines,\thicklines` adjust line thickness

Color (color)

`\color{color}` change color
`\textcolor{color}{text}` colored text
`\colorbox{color}{text}` colored background
`\fcolorbox{col1}{col2}{text}` colored border & background
`\setlength{\fboxsep}{5pt}` put space around text
`\setlength{\fboxrule}{3pt}` width of border of box
`\pagecolor{color}` set background color of page
`\definecolor{name}{rgb}{r,g,b}` define an RGB color
`\definecolor{name}{cmk}{c,m,y,k}` define a CMYK color

Predefined Colors

black, white, red, green, blue, yellow, cyan, magenta

BIB_{TEX}

• BIB_{TEX} File Suffixes

`.bib` BIB_{TEX} bibliographic database file
`.bst` BIB_{TEX} bibliographic style file
`.blg` BIB_{TEX} log file
`.bbl` BIB_{TEX} document bibliography file

• BIB_{TEX} Commands in Document File

`\bibliographystyle{bib style file}`

Examples: `plain`, `amsplain`, `unsrt`, `alpha`, `abbrv`

`\bibliography{bib database file(s)}`

`\cite{label}` cite a reference

`\nocite{label}` include ref in bib without citation

`\nocite{*}` include all references in bibliography

• Creating BIB_{TEX} Database File

`@STRING{name = "text"}` define an abbreviation

Put braces around non-initial capitalized title words.

Use `and` to separate multiple authors in `author` field

• General Format of a Database Entry

`@ENTRYTYPE{label,`
`fieldtype1 = {entry1},`
`fieldtype2 = {entry2},`
`...`
`}`

• Database Entry Types

`@ARTICLE{...}` `@MASTERSTHESIS{...}`
`@BOOK{...}` `@MISC{...}`
`@BOOKLET{...}` `@PHDTHESIS{...}`
`@INBOOK{...}` `@PROCEEDINGS{...}`
`@INCOLLECTION{...}` `@TECHREPORT{...}`
`@INPROCEEDINGS{...}` `@UNPUBLISHED{...}`
`@MANUAL{...}` `@COMMENT{...}`

• Field Types Within Entries

<code>address</code>	<code>editor</code>	<code>month</code>	<code>school</code>
<code>author</code>	<code>howpublished</code>	<code>note</code>	<code>series</code>
<code>booktitle</code>	<code>institution</code>	<code>number</code>	<code>title</code>
<code>chapter</code>	<code>journal</code>	<code>organization</code>	<code>type</code>
<code>crossref</code>	<code>key</code>	<code>pages</code>	<code>volume</code>
<code>edition</code>	<code>language</code>	<code>publisher</code>	<code>year</code>

• Creating Document Bibliography With BIB_{TEX}

- (1) Typeset document to get new `.aux` file.
- (2) Run BIB_{TEX} on `.aux` file to create `.bbl` file.
- (3) Retypeset document twice.

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