

AMS-L^AT_EX Reference Card #1

See the T_EX 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]{...}
\curraddress{...}
\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}{righthhead}
and \markright{righthhead}
```

```
\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
intllimits, sunlimits, nonamlimits
AMS (Postscript) Fonts
psamsfonts, noamsfonts
```

Bibliography (see also BIB_TE_X)

```
\begin{thebibliography}{99}... \end{...}
bibliography with widest label specified
\bibitem{name} named bibliography item
\bibitem[label]{name} with alternative label to print
\byname 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

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

• Table of Contents

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

Tables and Figures

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

Lists

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

Displayed Text Material

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

Footnotes, Comments, Other Stuff

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

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
 \quad \quad white space (1 space, 1 em, 2 em)
 \hspace{10pt} specified horizontal space
 \hspace*{10pt} space even at line start
 Horizontal Spacing (Math): \, thin space \: med space
 \; thick space \! neg. thin space \mspace{muglue}
 \strut,\mathstrut invisible vertical space
 invisible space
 \vphantom{...} invisible vertical space
 \smash[bt]{...} typeset w/zero height,depth
 \hfill fill with space
 \dotfill fill with dots
 \hrulefill fill with rule (line)
 \par new paragraph
 \newline or \\ force a new line
 * new line, prohibit page break
 \\[5pt] new line skipping 5 pts
 \vspace{1in} specified vertical space
 \vspace*{1in} space even at page start
 \newpage force a new page

• Length Variables

\newlength{\lngth} create length variable \lngth
 \setlength{\lngth}{dimen} set value of \lngth
 \addtolength{\lngth}{dimen} increase \lngth

• Useful Length Assignments

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

Accents

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

Additional Text Symbols

\dag	†	\copyright	©	\pounds	£
\ddag	‡	\textcircled{r}	Ⓡ		
\P	¶	\textvisiblespace	␣		
\S	§	\textbullet	•		

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{...} caligraphic $\mathcal{A}, \mathcal{B}, \mathcal{C}$
 \usepackage{eucal} redef \mathcal to script $\mathcal{A}, \mathcal{B}, \mathcal{C}$
 \mathfrak{...} Fraktur $\mathfrak{A}, \mathfrak{a}, \mathfrak{B}, \mathfrak{b}$ (amsfonts)
 \mathbb{...} Blackboard bold $\mathbb{A}, \mathbb{B}, \mathbb{C}$ (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 overfills
 \overfullrule width of overfull marker
 \begin{setlength}{\hfuzz}{2pt}... \end{...}
 allow small overfills

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}{Opt} 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

AMS-L^AT_EX Reference Card #2

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

Math Environments

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

Theorems, Lemmas, Etc.

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

Commutative Diagrams (amscd)

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

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

Multiline Math Displays (amsmath)

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

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

Overlines, Underlines, and Arrows

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

Operator Names

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

Large Operators

\sum	\sum	\bigcap	\bigcap	\bigodot	\bigodot
\prod	\prod	\bigcup	\bigcup	\bigotimes	\bigotimes
\coprod	\coprod	\bigsqcup	\bigsqcup	\bigoplus	\bigoplus
\int	\int	\bigvee	\bigvee	\biguplus	\biguplus
\oint	\oint	\bigwedge	\bigwedge		
$\substack{xxx \\ yyy}$	stacked sub or superscripts				
\limits, \nolimits	force or forbid displayed limits				
$\oint, \iint, \iiint, \dots$	integral variants (amsmath)				

Delimiters

$[$	\lbrack or \lbrack	$\{$	\lbrace or \lbrace	\langle	\langle
$]$	\rbrack or \rbrack	$\}$	\rbrace or \rbrace	\rangle	\rangle
$ $	\vert or \vert	\lfloor	\lfloor	\lceil	\lceil
$\ $	\Vert or \Vert	\rfloor	\rfloor	\rceil	\rceil
\uparrow	\uparrow	\Uparrow	\Uparrow	\Updownarrow	\Updownarrow
\downarrow	\downarrow	\Downarrow	\Downarrow	\Downarrow	\Downarrow
$\left(\right)$	expanding delimiters				
$\left. \right.$	empty delimiters				
$\bigl(\bigr)$	big delimiters				
$\Bigl(\Bigr)$	bigger delimiters				
$\biggl(\biggr)$	even bigger delimiters				
$\bigm , \biggm $	big binary relation delimiters				

Roots

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

Ellipses

\ldots, \cdots, \dots	ellipses
\vdots, \ddots	vertical and diagonal dots
$\dotsc, \dotsb, \dotsm, \dotsi$	more ellipses (amsmath)

Fractions and Stacked Relations

$\frac{n}{d}$	fraction $\frac{n}{d}$
$\dfrac{n}{d}$	displaystyle fraction
$\tfrac{n}{d}$	textstyle fraction
$\binom{n}{d}$	binomial coefficient $\binom{n}{d}$
$\genfrac{l}{r}{d}{t}{c}{n}{den}$	
$\cfrac{\dots}{\dots}$	continued fraction
$\stackrel{top}{\underset{bot}{\dots}}$	stacked relation
$\overset{top}{\underset{bot}{\dots}}$	stacked symbol (amsmath)
$\underset{bot}{\overset{top}{\dots}}$	stacked relation (amsmath)
$\sideset{ll}{ul}{lr}{ur}{largeop}$	large operator with left/right sub/supscripts

Negated Relations

\not	negate a relation
\neq	not equal \neq
\notin	not a member of \notin
\nmid	not divisible \nmid

User Defined Commands

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

User Defined Environments

`\newenvironment{name}{pretext}{posttext}`
new environment with material before and after
`\newenvironment[n]{name}{...}{...}`
environment with n arguments
`\newenvironment[n][default]{name}{...}{...}`
environment with default value for #1
`\renewenvironment{name}{...}{...}` 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 \LaTeX to create an `.idx` file

`\printindex` tell \LaTeX 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|{} ... \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` tell \LaTeX to create a `.glo` file

`\glossary{entry}` create a glossary entry

`\glossaryentry{entry}{page no.}` entries in `.glo` file

`\input filename.glo` read glossary file

User must define `\makeglossary`, e.g.,

`\newcommand{\glossaryentry}[2]{\#1, page \#2\par}`

Time and Date

`\today` current date

Use `\the` to display the following items

`\day`, `\month`, `\year`, `\time` (minutes since midnight)

Counters

`\newcounter{cntr}` create new counter named `cntr`
`\resetcounter{cntr}` reset `cntr` when `cntr1` changes
`\setcounter{cntr}{value}` set value of `cntr`
`\stepcounter{cntr}` increment `cntr`
`\refstepcounter{cntr}` increment and reset `\label`
`\addtocounter{cntr}{n}` increment by n
`\value{cntr}` value stored in `\cntr`
`\thecntr` the value of `cntr`
`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 L^Ampport 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)[lrtb]` oval (part or whole)

`\shortstack{abc\backslash xyz}` stacked text

`\framebox(x,y)[tblr]{text}` framed text

`\frame{text},\fbox{text}` other framed boxes

`\dashbox{d}(x,y){text}` dashed box

`\qbezier(x1,y1)(x2,y2)(x3,y3)` 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}{cmyk}{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`, `amspain`, `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

`address` `editor` `month` `school`

`author` `howpublished` `note` `series`

`booktitle` `institution` `number` `title`

`chapter` `journal` `organization` `type`

`crossref` `key` `pages` `volume`

`edition` `language` `publisher` `year`

• 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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