TEX Reference Card

(for Plain TEX)

Greek Letters

α	\alpha	ι	\iota	ϱ	\varrho
β	\beta	κ	\kappa	σ	\sigma
γ	\gamma	λ	\lambda	ς	\varsigma
δ	\delta	μ	\mu	τ	\tau
ϵ	\epsilon	ν	\nu	υ	\upsilon
ε	\varepsilon	ξ	\xi	ϕ	\phi
ζ	\zeta	o	\o	φ	\varphi
η	\eta	π	\pi	χ	\chi
θ	\theta	ϖ	\varpi	ψ	\psi
ϑ	\vartheta	ρ	\rho	ω	\omega
Γ	\Gamma	Ξ	\Xi	Φ	\Phi
Δ	\Delta	Π	\Pi	Ψ	\Psi
Θ	\Theta	Σ	\Sigma	Ω	\Omega
Λ	\Lambda	Υ	\Upsilon		

Symbols of Type Ord

$\aleph$	\aleph	$\prime$	\prime	$\forall$	\forall
$\hbar$	\hbar	$\emptyset$	\emptyset	$\exists$	\exists
$\imath$	\imath	∇	\nabla	$\neg$	\neg or \lnot
$\jmath$	\jmath	$\surd$	\surd	$\flat$	\flat
ℓ	\ell	$\top$	\top	$\natural$	\natural
$\wp$	\wp	$\bot$	\bot	$\sharp$	\sharp
$\Re$	\Re	$\vert$	\vert	$\clubsuit$	\clubsuit
$\Im$	\Im	$\angle$	\angle	$\diamondsuit$	\diamondsuit
∂	\partial	$\triangle$	\triangle	$\heartsuit$	\heartsuit
∞	\infty	$\backslash$	\backslash	$\spadesuit$	\spadesuit

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		

Binary Operations

$\pm$	\pm	$\cap$	\cap	$\vee$	\vee or \lor
$\mp$	\mp	$\cup$	\cup	$\wedge$	\wedge or \land
$\setminus$	\setminus	$\uplus$	\uplus	$\oplus$	\oplus
$\cdot$	\cdot	$\sqcap$	\sqcap	$\ominus$	\ominus
$\times$	\times	$\sqcup$	\sqcup	$\otimes$	\otimes
$*$	\ast	$\triangleleft$	\triangleleft	$\oslash$	\oslash
$\star$	\star	$\triangleright$	\triangleright	$\odot$	\odot
$\diamond$	\diamond	$\wr$	\wr	$\dagger$	\dagger
$\circ$	\circ	$\bigcirc$	\bigcirc	$\ddagger$	\ddagger
$\bullet$	\bullet	$\bigtriangleup$	\bigtriangleup	$\amalg$	\amalg
$\div$	\div	$\bigtriangledown$	\bigtriangledown		

Page Layout

\hsize=⟨dimen⟩	set width of page
\vsize=⟨dimen⟩	set height of page
\displaywidth=⟨dimen⟩	set width of math displays
\hoffset=⟨dimen⟩	move page horizontally
\voffset=⟨dimen⟩	move page vertically

Relations

$\leq$	\leq or \le	$\geq$	\geq or \ge	$\equiv$	\equiv
$\prec$	\prec	$\succ$	\succ	$\sim$	\sim
$\preceq$	\preceq	$\succeq$	\succeq	$\simeq$	\simeq
$\ll$	\ll	$\gg$	\gg	$\asymp$	\asymp
$\subset$	\subset	$\supset$	\supset	$\approx$	\approx
$\subseteq$	\subseteq	$\supseteq$	\supseteq	$\cong$	\cong
$\sqsubseteq$	\sqsubseteq	$\sqsupseteq$	\sqsupseteq	$\bowtie$	\bowtie
$\in$	\in	$\notin$	\notin	$\ni$	\ni or \owns
$\vdash$	\vdash	$\dashv$	\dashv	$\models$	\models
$\smile$	\smile	$\mid$	\mid	$\doteq$	\doteq
$\frown$	\frown	$\parallel$	\parallel	$\perp$	\perp
$\propto$	\propto				

Most relations can be negated by prefixing them with \not.

$\not\equiv$	\not\equiv	$\notin$	\notin	$\neq$	\ne

Arrows

$\leftarrow$	\leftarrow or \gets	$\longleftarrow$	\longleftarrow
$\Leftarrow$	\Leftarrow	$\Longleftarrow$	\Longleftarrow
$\rightarrow$	\rightarrow or \to	$\longrightarrow$	\longrightarrow
$\Rightarrow$	\Rightarrow	$\Longrightarrow$	\Longrightarrow
$\leftrightarrow$	\leftrightarrow	$\longleftrightarrow$	\longleftrightarrow
$\Leftrightarrow$	\Leftrightarrow	$\Longleftrightarrow$	\Longleftrightarrow
$\mapsto$	\mapsto	$\longmapsto$	\longmapsto
$\hookleftarrow$	\hookleftarrow	$\hookrightarrow$	\hookrightarrow
$\uparrow$	\uparrow	$\Uparrow$	\Uparrow
$\downarrow$	\downarrow	$\Downarrow$	\Downarrow
$\updownarrow$	\updownarrow	$\Updownarrow$	\Updownarrow
$\nearrow$	\nearrow	$\searrow$	\searrow
$\nwarrow$	\nwarrow	$\swarrow$	\swarrow

The \buildrel macro puts one symbol over another. The format is \buildrel⟨superscript⟩\over⟨relation⟩.

$\xrightarrow{\alpha\beta}$ `\buildrel\alpha\beta\over\longrightarrow`

$f(x) \stackrel{\text{def}}{=} x+1$ `f(x)\; {\buildrel\rm def\over=} \;x+1`

Delimeters

[	\lbrack or [	{	\lbrace or \{	⟨	\langle
]	\rbrack or]	}	\rbrace or \}	⟩	\rangle
|	\vert or |	⌊	\lfloor	⌈	\lceil
‖	\Vert or \\|	⌋	\rfloor	⌉	\rceil
⟦	[\![	⟪	(\!(	⟪	\langle\!\langle
⟧	]\!]	⟫	)\!)	⟫	\rangle\!\rangle

Left and right delimeters will be enlarged if they are prefixed with \left or \right. Each \left must have a matching \right, one of which may be an empty delimeter (\left. or \right.). To specify a particular size, use the following:

\bigl, \bigr \Bigl, \Bigr \biggl, \biggr

You can also say \bigm for a large delimenter in the middle of a formula, or just \big for one that acts as an ordinary symbol.

Every Time Insertions

\everypar	insert whenever a paragraph begins
\everymath	insert whenever math in text begins
\everydisplay	insert whenever displayed math begins
\everycr	insert after every \cr

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

The \skew⟨number⟩ command shifts accents for proper positioning, the larger the ⟨number⟩, the more right the shift. Compare

`\hat{\hat A}` gives $\hat{\hat{A}}$, `\skew6\hat{\hat A}` gives $\hat{\skew6\hat{A}}$.

Elementary Math Control Sequences

overline a formula	$\overline{x+y}$	`\overline{x+y}`
underline a formula	$\underline{x+y}$	`\underline{x+y}`
square root	$\sqrt{x+2}$	`\sqrt{x+2}`
higher order roots	$\sqrt[n]{x+2}$	`\root n\of{x+2}`
fraction	$\frac{n+1}{3}$	`{n+1\over 3}`
fraction, no line	$n+1 \atop 3$	`{n+1\atop 3}`
binomial coeff.	$\binom{n+1}{3}$	`{n+1\choose 3}`
braced fraction	$\left\{{n+1 \atop 3}\right\}$	`{n+1\brace 3}`
bracketed fraction	$\left[{n+1 \atop 3}\right]$	`{n+1\brack 3}`

The following specify a style for typesetting formulas.

`\displaystyle \textstyle \scriptstyle \scriptscriptstyle`

Non-Italic Function Names

`\arccos \cos \csc \exp \ker \limsup \min \sinh`
`\arcsin \cosh \deg \gcd \lg \ln \Pr \sup`
`\arctan \cot \det \hom \lim \log \sec \tan`
`\arg \coth \dim \inf \liminf \max \sin \tanh`

a \pmod{m}	$a \pmod m$	mod with parentheses
a \bmod m	$a \bmod m$	mod without parentheses

The following examples use \mathop to create function names.

Example	Command	Plain TEX Definition
$\lim_{x\to 2}$	\lim_{x\to2}	\def\lim{\mathop{\rm lim}}
$\log_2$	\log_2	\def\log{\mathop{\rm log}\nolimits}

Footnotes, Insertions, and Underlines

\footnote⟨marker⟩{⟨text⟩}	footnote
\topinsert⟨vmode material⟩\endinsert	insert at top of page
\pageinsert⟨vmode material⟩\endinsert	insert on full page
\midinsert⟨vmode material⟩\endinsert	insert middle of page
\underbar{⟨text⟩}	underline text

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Useful Parameters and Conversions

`\day,\month,\year`	the current day, month, year
`\jobname`	name of current job
`\romannumeral`⟨number⟩	convert to lower case roman nums.
`\uppercase{`⟨token list⟩`}`	convert to upper case
`\lowercase{`⟨token list⟩`}`	convert to lower case

Fills, Leaders and Ellipses

Text or Math: … `\dots` ⋮ `\vdots` ⋱ `\ddots`
Math: … `\ldots` ⋯ `\cdots`

The following fill space with the indicated item.
`\hrulefill` `\rightarrowfill` `\leftarrowfill` `\dotfill`

The general format for constructing leaders is

`\leaders`⟨box or rule⟩`\hskip`⟨glue⟩	repeat box or rule
`\leaders`⟨box or rule⟩`\hfill`	fill space with box or rule

TEX Fonts and Magnification

`\rm` Roman `\bf` **Bold** `\tt` `Typewriter`
`\sl` *Slant* `\it* *Italic* `\/` "italic correction"

`\magnification=`⟨number⟩	scale document by $n/1000$
`\magstep`⟨number⟩	scaling factor of $1.2^n \times 1000$
`\magstephalf`	scalling factor of $\sqrt{1.2}$
`\font\FN=`⟨fontname⟩	load a font, naming it `\FN`
`\font\FN=`⟨fontname⟩ `at` ⟨dimen⟩	load font scaled to dimension
`\font\FN=`⟨fontname⟩ `scaled` ⟨number⟩	load font scaled by $n/1000$
`true` ⟨dimen⟩	dimension with no scaling

Alignment Displays

`\settabs`⟨number⟩`\columns`	set equally spaced tabs
`\settabs\+`⟨sample line⟩`\cr`	set tabs as per sample line
`\+`⟨text$_1$⟩`&`⟨text$_2$⟩`&`$\cdots$`\cr`	tabbed text to be typeset
`\halign`	horizontal alignment
`\halign to`⟨dimen⟩	horizontal alignment
`\openup`⟨dimen⟩	add space between lines
`\noalign{`⟨vmode material⟩`}`	insert material after any `\cr`
`\tabskip=`⟨glue⟩	set glue at tab stops
`\omit`	omit the template for a column
`\span`	span two columns
`\multispan`⟨number⟩	span several columns
`\hidewidth`	ignore the width of an entry
`\crcr`	insert `\cr` if one is not present

Boxes

`\hbox to`⟨dimen⟩	hbox of given dimension
`\vbox to`⟨dimen⟩	vbox, bottom justified
`\vtop to`⟨dimen⟩	vbox, top justified
`\vcenter to`⟨dimen⟩	vbox, center justified (math only)
`\rlap`	right overlap material
`\llap`	left overlap material

Overfull Boxes

`\hfuzz`	allowable excess in hboxes
`\vfuzz`	allowable excess in vboxes
`\overfullrule`	width of overfull box marker. To eliminate entirely, set `\overfullrule=0pt`.

Indentation and Itemized Lists

`\indent`	indent
`\noindent`	do not indent
`\parindent=`⟨dimen⟩	set indentation of paragraphs
`\displayindent=`⟨dimen⟩	set indentation of math displays
`\leftskip=`⟨dimen⟩	skip space on left
`\rightskip=`⟨dimen⟩	skip space on right
`\narrower`	make paragraph narrower
`\item{`⟨label⟩`}`	singly indented itemized list
`\itemitem{`⟨label⟩`}`	doubly indented itemized list
`\hangindent=`⟨dimen⟩	hanging indentation for paragraph
`\hangafter=`⟨number⟩	start hanging indent after line n. If $n<0$, indent first $\lvert n\rvert$ lines.
`\parshape=`⟨number⟩	general paragraph shaping macro

Headers, Footers, and Page Numbers

`\nopagenumbers`	turn off page numbering
`\pageno`	current page number. To get roman nums, set `\pageno=`⟨negative number⟩
`\folio`	current page number, roman num if <0
`\footline`	material to put at foot of page
`\headline`	material to put at top of page. To leave space, set `\voffset=2\baselineskip`, make room with `\advance\vsize by-\voffset`.

Macro Definitions

`\def\cs{`⟨replacement text⟩`}`	define the macro `\cs`
`\def\cs#1`$\cdots$`#`n{⟨repl. text⟩`}`	macro with parameters
`\let\cs=`⟨token⟩	give `\cs` token's current meaning

Advanced Macro Definition Commands

`\long\def`	macro whose args may include `\par`
`\outer\def`	macro not allowed inside definitions
`\global\def` or `\gdef`	definition that transcends grouping
`\edef`	expand while defining macro
`\xdef` or `\global\edef`	global version of `\edef`
`\noexpand`⟨token⟩	do not expand token
`\expandafter`⟨token⟩	expand item after token first
`\futurelet\cs`⟨tok$_1$⟩⟨tok$_2$⟩	equals `\let\cs=`⟨tok$_2$⟩⟨tok$_1$⟩⟨tok$_2$⟩
`\csname`…`\endcsname`	create a control sequence name
`\string\cs`	list characters in name, `\ c s`
`\number`⟨number⟩	list of characters in number
`\the`⟨internal quantity⟩	list of tokens giving value of quantity

Conditionals

The general format of a conditional is
`\if`⟨condition⟩⟨true text⟩`\else`⟨false text⟩`\fi`

`\ifnum`⟨num$_1$⟩⟨relation⟩⟨num$_2$⟩	compare two integers
`\ifdim`⟨dimen$_1$⟩⟨relation⟩⟨dimen$_2$⟩	compare two dimensions
`\ifodd`⟨num⟩	test for an odd integer
`\ifmmode`	test for math mode
`\if`⟨token$_1$⟩⟨token$_2$⟩	test if character codes agree
`\ifdim`	compare two dimensions
`\ifx`⟨token$_1$⟩⟨token$_2$⟩	test if tokens agree
`\ifeof`⟨number⟩	test for end of file
`\iftrue`, `\iffalse`	always true, always false
`\ifcase`⟨number⟩⟨text$_0$⟩`\or`⟨text$_1$⟩`\or`$\cdots$ `\or`⟨text$_n$⟩`\else`⟨text⟩`\fi`	choose text by ⟨number⟩
`\loop` α `\if`…β `\repeat`	loop $\alpha\beta\alpha\cdots\alpha$ until `\if` is false
`\newif\ifblob`	create a new conditional called `\ifblob`
`\blobtrue`, `\blobfalse`	set conditional `\ifblob` true, false

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

Horizontal Spacing: `\quad` (skip 1em) `\qquad`
Horizontal Spacing (Text): `\thinspace` `\enspace` `\enskip` `\hskip`⟨glue⟩ `\hfil` `\hfill` `\hfilneg`
Horizontal Spacing (Math): thin space `\,` medium space `\>` thick space `\;` neg. thin space `\!` `\mskip`⟨muglue⟩

Vertical Spacing:	`\vskip`⟨glue⟩ `\vfil` `\vfill`
`\strut`	box w/ ht and depth of "(", zero width
`\phantom{`⟨text⟩`}`	invisible box with dim of ⟨text⟩
`\vphantom{`⟨text⟩`}`	box w/ ht & depth of ⟨text⟩, zero width
`\hphantom{`⟨text⟩`}`	box w/ width of ⟨text⟩, zero ht & depth
`\smash{`⟨text⟩`}`	typeset ⟨text⟩, set ht & depth to zero
`\raise`⟨dimen⟩`\hbox{`⟨text⟩`}`	raise box up
`\lower`⟨dimen⟩`\hbox{`⟨text⟩`}`	lower box down
`\moveleft`⟨dimen⟩`\vbox{`⟨text⟩`}`	move box left
`\moveright`⟨dimen⟩`\vbox{`⟨text⟩`}`	move box right
Skip Space Between Lines:	`\smallskip` `\medskip` `\bigskip`
encourage a break	`\smallbreak` `\medbreak` `\bigbreak`
break if no room	`\filbreak`
Set Line Spacing:	`\baselineskip =` ⟨glue⟩
single space	`\baselineskip = 12pt`
1 1/2 space	`\baselineskip = 18pt`
double space	`\baselineskip = 24pt`
Increase Line Spacing	`\openup`⟨dimen⟩
use `\jot`'s	`1\jot = 3pt`
Allow Unjustified Lines	`\raggedright`
Allow Unjustified Pages	`\raggedbottom`

Braces and Matrices

`\matrix`	rectangular array of entries
`\pmatrix`	matrix with parentheses
`\bordermatrix`	matrix with labels on top and left
`\overbrace`	overbrace, may be superscripted
`\underbrace`	underbrace, may be subscripted

For small matrices in text, use the following constructions:

`{a\,b \choose c\,d}` $\binom{a\,b}{c\,d}$
`\left( {a\atop c} {b\atop d} \right)` $\left(\begin{smallmatrix} a & b \\ c & d \end{smallmatrix}\right)$

Displayed Equations

`\eqno`	equation number at right
`\leqno`	equation number at left
`\eqalign`	display several aligned equations
`\eqalignno`	display aligned equations numbered at right
`\leqalignno`	display aligned equations numbered at left
`\displaylines`	display several equations, centered
`\cases`	case by case definitions
`\noalign`	to insert space between lines in displays, use `\noalign{\vskip`⟨glue⟩`}` after any `\cr`
`\openup`⟨dimen⟩	add space between all lines in a display

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