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
Δ	\Delta	Π	\Pi
Θ	\Theta	Σ	\Sigma
Λ	\Lambda	Υ	\Upsilon
		Φ	\Phi
		Ψ	\Psi
		Ω	\Omega

Symbols of Type Ord

ℵ	\aleph	′	\prime
ℏ	\hbar	∅	\emptyset
ι	\imath	∇	\nabla
j	\jmath	√	\surd
ℓ	\ell	⊤	\top
℘	\wp	⊥	\bot
ℜ	\Re	‖	|
ℑ	\Im	∠	\angle
∂	\partial	△	\triangle
∞	\infty	\	\backslash
∀	\forall	¬	\neg or \lnot
∃	\exists	♭	\flat
♮	\natural	♯	\sharp
♣	\clubsuit	♢	\diamondsuit
♡	\heartsuit	♠	\spadesuit

Large Operators

∑	\sum	∏	\prod
∐	\coprod	∫	\int
∮	\oint	⋂	\bigcap
⋃	\bigcup	⊔	\bigsqcup
⋁	\bigvee	⋀	\bigwedge
⊙	\bigodot	⊗	\bigotimes
⊕	\bigoplus	⊎	\biguplus

Binary Operations

±	\pm	∓	\mp
∖	\setminus	·	\cdot
×	\times	∗	\ast
⋆	\star	⋄	\diamond
∘	\circ	•	\bullet
÷	\div	∩	\cap
∪	\cup	⊎	\uplus
⊓	\sqcap	⊔	\sqcup
◁	\triangleleft	▷	\triangleright
≀	\wr	◯	\bigcirc
△	\bigtriangleup	▽	\bigtriangledown
∨	\vee or \lor	∧	\wedge or \land
⊕	\oplus	⊖	\ominus
⊗	\otimes	⊘	\oslash
⊙	\odot	†	\dagger
‡	\ddagger	⨿	\amalg

Relations

≤	\leq or \le	≥	\geq or \ge
≺	\prec	≻	\succ
⪯	\preceq	⪰	\succeq
≪	\ll	≫	\gg
⊂	\subset	⊃	\supset
⊆	\subseteq	⊇	\supseteq
⊑	\sqsubseteq	⊒	\sqsupseteq
∈	\in	∋	\ni or \owns
⊢	\vdash	⊣	\dashv
⌣	\smile	⊨	\models
⌢	\frown	∣	\mid
‖	\parallel	⊥	\perp
≡	\equiv	∼	\sim
≃	\simeq	≍	\asymp
≈	\approx	⋈	\bowtie
≅	\cong	∝	\propto
⊏	\sqsubset	⊐	\sqsupset
⋈	\Join	≐	\doteq

≢	\not\equiv
∉	\notin
≠	\ne

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

Arrows

←	\leftarrow or \gets	⟵	\longleftarrow
⇐	\Leftarrow	⟸	\Longleftarrow
→	\rightarrow or \to	⟶	\longrightarrow
⇒	\Rightarrow	⟹	\Longrightarrow
↔	\leftrightarrow	⟷	\longleftrightarrow
⇔	\Leftrightarrow	⟺	\Longleftrightarrow
↦	\mapsto	⟼	\longmapsto
↩	\hookleftarrow	↪	\hookrightarrow
↑	\uparrow	⇑	\Uparrow
↓	\downarrow	⇓	\Downarrow
↕	\updownarrow	⇕	\Updownarrow
↗	\nearrow	↘	\searrow
↖	\nwarrow	↙	\swarrow

The \buildrel macro puts one symbol over another. The format is \buildrel(superscript)\over(relation).

$$f(x) \stackrel{\mathrm{def}}{=} x+1$$

\buildrel\alpha\beta\over\longrightarrow
f(x)\; {\buildrel\rm def\over=} \;x+1

Delimeters

[	\lbrack or [	{	\lbrace or \{
]	\rbrack or]	}	\rbrace or \}
⌊	\lfloor	⌈	\lceil
⌋	\rfloor	⌉	\rceil
⟨	\langle	⟩	\rangle
‖	\Vert or |			\vert or |

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   \Biggl, \Biggr

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

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

\hat{\hat A} gives Â,   \skew6\hat{\hat A} gives Â.

The \skew(number) command shifts accents for proper positioning; the larger the (number), the more right the shift. Compare

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	$\frac{n+1}{n+1}$	{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	$\{n+1 \atop 3\}$	{n+1\brace 3}
bracketed fraction	$[n+1 \atop 3]$	{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
$\log_2$ \log_2   \def\log{\mathop{\rm log}\nolimits}
$\lim_{x\to2}$ \lim_{x\to2}   \def\lim{\mathop{\rm lim}}

Large Operators (continued)

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

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

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

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: ... \ldots ⋯ \cdots

Math: ⋮ \vdots ⋱ \ddots

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

The following fill space with the indicated item.

\hrulefill \rightarrowfill \leftarrowfill \dotfill

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	scaling 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
\+⟨text₁⟩&⟨text₂⟩&···\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 $|n|$ 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...#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⟨tok₁⟩\⟨tok₂⟩	equals \let\cs=⟨tok₂⟩⟨tok₁⟩⟨tok₂⟩
\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⟨num1⟩⟨relation⟩⟨num2⟩	compare two integers
\ifdim⟨dimen1⟩⟨relation⟩⟨dimen2⟩	compare two dimensions
\ifodd⟨num⟩	test for an odd integer
\ifmmode	test for math mode
\if⟨token₁⟩⟨token₂⟩	test if character codes agree
\ifx⟨token₁⟩⟨token₂⟩	compare two dimensions
\ifdim	test if tokens agree
\ifeof⟨number⟩	test for end of file
\iftrue, \iffalse	always true, always false
\ifcase⟨number⟩⟨text₀⟩\or⟨text₁⟩\or...\or⟨textₙ⟩\else⟨text⟩\or...	choose text by ⟨number⟩
\newif\ifblob	create a new conditional called \ifblob
\blobtrue, \blobfalse	set conditional \ifblob true, false

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

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

Vertical Spacing:

\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	\filbreak
break if no room	\smallbreak \medbreak \bigbreak

Set Line Spacing:

single space	\baselineskip = 12pt
1 1/2 space	\baselineskip = 18pt
double space	\baselineskip = 24pt

Increase Line Spacing

use \jot's	\openup⟨dimen⟩

1\jot = 3pt

Allow Unjustified Lines	\raggedright
Allow Unjustified Pages	\raggedbottom

Horizontal Spacing:

\hskip⟨glue⟩ \hfil \hfill \hfilneg

\quad (skip 1em) \qquad

\thinspace \enspace \enskip

Horizontal Spacing (Math): thin space \,, medium space \>, thick space \;, neg. thin space \!

\vskip⟨glue⟩ \vfil \vfill

\smallskip \medskip \bigskip

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:

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