TEX Reference Card

(for Plain TEX)

Greek Letters

- α `\alpha`
- β `\beta`
- γ `\gamma`
- δ `\delta`
- ϵ `\epsilon`
- ε `\varepsilon`
- ζ `\zeta`
- η `\eta`
- θ `\theta`
- ϑ `\vartheta`
- ι `\iota`
- κ `\kappa`
- λ `\lambda`
- μ `\mu`
- ν `\nu`
- ξ `\xi`
- o `\o`
- π `\pi`
- ϖ `\varpi`
- ρ `\rho`
- ϱ `\varrho`
- σ `\sigma`
- ς `\varsigma`
- τ `\tau`
- υ `\upsilon`
- ϕ `\phi`
- φ `\varphi`
- χ `\chi`
- ψ `\psi`
- ω `\omega`

- Γ `\Gamma`
- Δ `\Delta`
- Θ `\Theta`
- Λ `\Lambda`
- Ξ `\Xi`
- Π `\Pi`
- Σ `\Sigma`
- Υ `\Upsilon`
- Φ `\Phi`
- Ψ `\Psi`
- Ω `\Omega`

Symbols of Type Ord

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

Large Operators

- $\sum$ `\sum`
- $\prod$ `\prod`
- $\coprod$ `\coprod`
- $\int$ `\int`
- $\oint$ `\oint`
- $\bigcap$ `\bigcap`
- $\bigcup$ `\bigcup`
- $\bigsqcup$ `\bigsqcup`
- $\bigvee$ `\bigvee`
- $\bigwedge$ `\bigwedge`
- $\bigodot$ `\bigodot`
- $\bigotimes$ `\bigotimes`
- $\bigoplus$ `\bigoplus`
- $\biguplus$ `\biguplus`

Binary Operations

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

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

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

- $\not\equiv$ `\not\equiv`
- $\notin$ `\notin`
- $\ne$ `\ne`

Arrows

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

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

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

Delimeters

- $[$ `\lbrack` or `[`
- $]$ `\rbrack` or `]`
- $\vert$ `\vert` or `|`
- $\Vert$ `\Vert` or `\|`
- $[\![$ `[\![`
- $]\!]$ `]\!]`
- $\{$ `\lbrace` or `\{`
- $\}$ `\rbrace` or `\}`
- $\lfloor$ `\lfloor`
- $\rfloor$ `\rfloor`
- $(\!($ `(\!(`
- $)\!)$ `)\!)`
- $\langle$ `\langle`
- $\rangle$ `\rangle`
- $\lceil$ `\lceil`
- $\rceil$ `\rceil`
- $\langle\!\langle$ `\langle\!\langle`
- $\rangle\!\rangle$ `\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 $\skew6\hat{\hat A}$.

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	$\root n\of{x+2}$	`\root n\of{x+2}`
fraction	${n+1\over 3}$	`{n+1\over 3}`
fraction, no line	${n+1\atop 3}$	`{n+1\atop 3}`
binomial coeff.	${n+1\choose 3}$	`{n+1\choose 3}`
braced fraction	${n+1\brace 3}$	`{n+1\brace 3}`
bracketed fraction	${n+1\brack 3}$	`{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
$\lim_{x\to2}$	`\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

Send comments and corrections to J.H. Silverman, Math. Dept., Brown Univ., Providence, RI 02912 USA. ⟨jhs@math.brown.edu⟩

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`		
Math:	... `\ldots`	⋯ `\cdots`	⋮ `\vdots`	⋱ `\ddots`

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$_2$⟩`&`⋯`\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`⟨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`⋯ `\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}`	${a\,b \choose c\,d}$
`\left( {a\atop c} {b\atop d} \right)`	$\left({a\atop c} {b\atop d} \right)$

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

Published by Ford & Mason Ltd, GL19 3JB, UK. Further copies of this card can be ordered through our web site: http://www.refcards.com.