

TEX Reference Card

(for Plain TEX)

Greek Letters

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

Symbols of Type Ord

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

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>		

Binary Operations

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

Page Layout

<code>\hsize=<dimen></code>	set width of page
<code>\vsize=<dimen></code>	set height of page
<code>\displaywidth=<dimen></code>	set width of math displays
<code>\hoffset=<dimen></code>	move page horizontally
<code>\voffset=<dimen></code>	move page vertically

Relations

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

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

\neq	<code>\not\equiv</code>	\notin	<code>\notin</code>	\neq	<code>\neq</code>
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Arrows

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

The `\buildrel` macro puts one symbol over another. The format is `\buildrel<superscript>\over<relation>`.

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

Delimiters

$[$	<code>\lbrack</code> or <code>[</code>	$\{$	<code>\lbrace</code> or <code>\{</code>	\langle	<code>\langle</code> or <code>\langle</code>
$]$	<code>\rbrack</code> or <code>]</code>	$\}$	<code>\rbrace</code> or <code>\}</code>	\rangle	<code>\rangle</code> or <code>\rangle</code>
$ $	<code>\vert</code> or <code> </code>	\lfloor	<code>\lfloor</code>	\lceil	<code>\lceil</code>
$\ $	<code>\Vert</code> or <code>\ </code>	\rfloor	<code>\rfloor</code>	\rceil	<code>\rceil</code>
\llbracket	<code>\llbracket</code>	\llcorner	<code>\llcorner</code>	\llangle	<code>\llangle</code>
\rrbracket	<code>\rrbracket</code>	\lrcorner	<code>\lrcorner</code>	\rrangle	<code>\rrangle</code>

Left and right delimiters 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 delimiter (`\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 delimiter in the middle of a formula, or just `\big` for one that acts as an ordinary symbol.

Every Time Insertions

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

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

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 $\hat{\hat{A}}$.

Elementary Math Control Sequences

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

The following specify a style for typesetting formulas.

`\displaystyle` `\textstyle` `\scriptstyle` `\scriptscriptstyle`

Non-Italic Function Names

<code>\arccos</code>	<code>\cos</code>	<code>\csc</code>	<code>\exp</code>	<code>\ker</code>	<code>\limsup</code>	<code>\min</code>	<code>\sinh</code>
<code>\arcsin</code>	<code>\cosh</code>	<code>\deg</code>	<code>\gcd</code>	<code>\lg</code>	<code>\ln</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>\liminf</code>	<code>\max</code>	<code>\sin</code>	<code>\tanh</code>
<code>a \pmod{m}</code>	$a \pmod{m}$		mod with parentheses				
<code>a \bmod m</code>	$a \bmod m$		mod without parentheses				

The following examples use `\mathop` to create function names.

Example	Command	Plain TeX Definition
$\lim_{x \rightarrow 2}$	<code>\lim_{x \rightarrow 2}</code>	<code>\def\lim{\mathop{\rm lim}}</code>
\log_2	<code>\log_2</code>	<code>\def\log{\mathop{\rm log}\nolimits}</code>

Footnotes, Insertions, and Underlines

<code>\footnote{⟨marker⟩{⟨text⟩}}</code>	footnote
<code>\topinsert{⟨mode material⟩}\endinsert</code>	insert at top of page
<code>\pageinsert{⟨mode material⟩}\endinsert</code>	insert on full page
<code>\midinsert{⟨mode material⟩}\endinsert</code>	insert middle of page
<code>\underbar{⟨text⟩}</code>	underline text

Useful Parameters and Conversions

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

Fills, Leaders and Ellipses

Text or Math:	<code>... \dots</code>			
Math:	<code>... \ldots</code>	<code>... \cdots</code>	<code>⋮ \vdots</code>	<code>⋯ \ddots</code>

The following fill space with the indicated item.

`\hrulefill` `\rightarrowfill` `\leftarrowfill` `\dotfill`

The general format for constructing leaders is

<code>\leaders⟨box or rule⟩\hskip⟨glue⟩</code>	repeat box or rule
<code>\leaders⟨box or rule⟩\hfill</code>	fill space with box or rule

TeX Fonts and Magnification

<code>\rm</code>	Roman	<code>\bf</code>	Bold	<code>\tt</code>	Typewriter
<code>\sl</code>	Slant	<code>\it</code>	Italic	<code>\/</code>	“italic correction”
<code>\magnification=⟨number⟩</code>	scale document by $n/1000$				
<code>\magstep⟨number⟩</code>	scaling factor of $1.2^n \times 1000$				
<code>\magstephalf</code>	scaling factor of $\sqrt{1.2}$				
<code>\font\FN=⟨fontname⟩</code>	load a font, naming it <code>\FN</code>				
<code>\font\FN=⟨fontname⟩ at ⟨dimen⟩</code>	scaled to dimension				
<code>\font\FN=⟨fontname⟩ scaled ⟨number⟩</code>	scaled by $n/1000$				
<code>true ⟨dimen⟩</code>	dimension with no scaling				
<code>\char‘c</code>	print the character or symbol c				

Alignment Displays

<code>\settabs⟨number⟩\columns</code>	set equally spaced tabs
<code>\settabs\+⟨sample line⟩\cr</code>	set tabs as per sample line
<code>\+⟨text₁⟩&⟨text₂⟩&... \cr</code>	tabbed text to be typeset
<code>\halign</code>	horizontal alignment
<code>\halign to⟨dimen⟩</code>	horizontal alignment
<code>\openup⟨dimen⟩</code>	add space between lines
<code>\noalign{⟨vmode material⟩}</code>	insert material after any <code>\cr</code>
<code>\tabskip=⟨glue⟩</code>	set glue at tab stops
<code>\omit</code>	omit the template for a column
<code>\span</code>	span two columns
<code>\multispan⟨number⟩</code>	span several columns
<code>\hidewidth</code>	ignore the width of an entry
<code>\crr</code>	insert <code>\cr</code> if one is not present

Boxes

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

Overfull Boxes

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

Indentation and Itemized Lists

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

Headers, Footers, and Page Numbers

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

Macro Definitions

<code>\def\cs{<replacement text>}</code>	define the macro <code>\cs</code>
<code>\def\cs#1...#n{<repl. text>}</code>	macro with parameters
<code>\let\cs=<token></code>	give <code>\cs</code> token's current meaning

Advanced Macro Definition Commands

<code>\long\def</code>	macro whose args may include <code>\par</code>
<code>\outer\def</code>	macro not allowed inside definitions
<code>\global\def</code> or <code>\gdef</code>	definition that transcends grouping
<code>\edef</code>	expand while defining macro
<code>\xdef</code> or <code>\global\edef</code>	global version of <code>\edef</code>
<code>\noexpand<token></code>	do not expand token
<code>\expandafter<token></code>	expand item after token first
<code>\futurelet\cs<tok₁><tok₂></code>	equals <code>\let\cs=<tok₂><tok₁><tok₂></code>
<code>\csname... \endcsname</code>	create a control sequence name
<code>\string\cs</code>	list characters in name, <code>\ c s</code>
<code>\number<number></code>	list of characters in number
<code>\the<internal quantity></code>	list of tokens giving value of quantity

Conditionals

The general format of a conditional is

<code>\if<condition><true text>\else<false text>\fi</code>	
<code>\ifnum<num₁><relation><num₂></code>	compare two integers
<code>\ifdim<dimen₁><relation><dimen₂></code>	compare two dimensions
<code>\ifodd<num></code>	test for an odd integer
<code>\ifmmode</code>	test for math mode
<code>\if<token₁><token₂></code>	test if character codes agree
<code>\ifx<token₁><token₂></code>	test if tokens agree
<code>\ifdim<dim₁><dim₂></code>	test if dimensions agree
<code>\ifeof<number></code>	test for end of file
<code>\iftrue, \iffalse</code>	always true, always false
<code>\ifcase<number><text₀>\or<text₁>\or... \or<text_n>\else<text>\fi</code>	choose text by <number>
<code>\loop α \if...β \repeat</code>	loop $\alpha\beta\alpha\cdots\alpha$ until <code>\if</code> is false
<code>\newif\ifblob</code>	create a new conditional called <code>\ifblob</code>
<code>\blobtrue, \blobfalse</code>	set conditional <code>\ifblob</code> 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}` $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$

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

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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Math. Dept., Brown Univ., Providence, RI 02912 USA

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