

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>	\prime	<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>
\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>
\mp	<code>\mp</code>	\cup	<code>\cup</code>	\wedge	<code>\wedge</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>
$*$	<code>\ast</code>	\triangleleft	<code>\triangleleft</code>	\oslash	<code>\oslash</code>
\diamond	<code>\diamond</code>	\triangleright	<code>\triangleright</code>	\odot	<code>\odot</code>
\circ	<code>\circ</code>	\wr	<code>\wr</code>	\dagger	<code>\dagger</code>
\bullet	<code>\bullet</code>	\bigcirc	<code>\bigcirc</code>	\ddagger	<code>\ddagger</code>
\div	<code>\div</code>	\bigtriangleup	<code>\bigtriangleup</code>	\amalg	<code>\amalg</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>
\sqsubset	<code>\sqsubset</code>	\sqsupset	<code>\sqsupset</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>	$\not\in$	<code>\notin</code>	\neq	<code>\neq</code>
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Arrows

\leftarrow	<code>\leftarrow</code> or <code>\gets</code>	\longleftarrow	<code>\longleftarrow</code>
\Leftarrow	<code>\Leftarrow</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>
\lefttriarrow	<code>\lefttriarrow</code>	\longleftrightarrow	<code>\longleftrightarrow</code>
\Leftrightarrow	<code>\Leftrightarrow</code>	\Longleftrightarrow	<code>\Longleftrightarrow</code>
\mapsto	<code>\mapsto</code>	\longmapsto	<code>\longmapsto</code>
\hookrightarrow	<code>\hookrightarrow</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>
\nrightarrow	<code>\nrightarrow</code>	\swarrow	<code>\swarrow</code>

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

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

Delimiters

$[$	<code>\lbrack</code> or <code>[</code>	$\{$	<code>\lbrace</code> or <code>\{</code>	\langle	<code>\langle</code>
$]$	<code>\rbrack</code> or <code>]</code>	$\}$	<code>\rbrace</code> or <code>\}</code>	\rangle	<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>
$[!$	<code>[!</code>	$(($	<code>((</code>	$\langle\!\langle$	<code>\langle\!\langle</code>
$]!$	<code>]!</code>	$)!$	<code>)!</code>	$\rangle\!\rangle$	<code>\rangle\!\rangle</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:

<code>\bigl</code> , <code>\bigr</code>	<code>\Bigl</code> , <code>\Bigr</code>	<code>\biggl</code> , <code>\biggr</code>
-----------------------------------------	-----------------------------------------	-------------------------------------------

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

$$\hat{\hat{A}} \quad \skew6\hat{\hat{A}}$$

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	$n \atop 3$	<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 \bmod m</code>	<code>a (mod m)</code>				mod with parentheses		
<code>a \bmod m</code>	<code>a mod m</code>				mod without parentheses		

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

Example	Command	Plain TeX Definition
$\lim_{x \rightarrow 2}$	<code>\lim_{x \to 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(vmode material)\endinsert</code>	insert at top of page
<code>\pageinsert(vmode material)\endinsert</code>	insert on full page
<code>\midinsert(vmode 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
`\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

<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>	load font scaled to dimension				
<code>\font\FN=(fontname) scaled (number)</code>	load font scaled by $n/1000$				
<code>true <dimen></code>	dimension with no scaling				

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>\crcr</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\vsiz</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\xdef</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
`\if<condition>(true text)\else(false text)\fi`

<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>\ifdim</code>	compare two dimensions
<code>\ifx(token₁)(token₂)</code>	test if tokens 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 $\alpha\beta\alpha\dots\alpha$ 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
`` 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

<code>\matrix</code>	rectangular array of entries
<code>\pmatrix</code>	matrix with parentheses
<code>\bordermatrix</code>	matrix with labels on top and left
<code>\overbrace</code>	overbrace, may be superscripted
<code>\underbrace</code>	underbrace, may be superscripted

For small matrices in text, use the following constructions:

$$\{a, b \ \text{\choose} \ c, d\} \qquad \begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

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

Displayed Equations

<code>\eqno</code>	equation number at right
<code>\leqno</code>	equation number at left
<code>\equaln</code>	display several aligned equations
<code>\equalnno</code>	display aligned equations numbered at right
<code>\leqalignno</code>	display aligned equations numbered at left
<code>\displaylines</code>	display several equations, centered
<code>\cases</code>	case by case definitions
<code>\noalign</code>	to insert space between lines in displays, use <code>\noalign{\vskip{glue}}</code> after any <code>\cr</code>
<code>\openup<dimen></code>	add space between all lines in a display

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