Symbols & Logical Syntax in LaTeX

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Greek & Hebrew Characters

Alphabetical Letters

A, α	\Alpha, \alpha	I, ι	\Iota, \iota	P, ρ, ϱ	\Rho, \rho, \varrho
B, β	\Beta, \beta	K, κ, $\varkappa$	\Kappa, \kappa, \varkappa	Σ, σ, ς	\Sigma, \sigma, \varsigma
Γ, γ	\Gamma, \gamma	Λ, λ	\Lambda, \lambda	T, τ	\Tau, \tau
Δ, δ	\Delta, \delta	M, μ	\Mu, \mu	Υ, υ	\Upsilon, \upsilon
E, ϵ, ε	\Epsilon, \epsilon, \varepsilon	N, ν	\Nu, \nu	Φ, ϕ, φ	\Phi, \phi, \varphi
Z, ζ	\Zeta, \zeta	Ξ, ξ	\Xi, \xi	X, χ	\Chi, \chi
H, η	\Eta, \eta	O, o	\Omicron, \omicron	Ψ, ψ	\Psi, \psi
Θ, θ, ϑ	\Theta, \theta, \vartheta	Π, π, ϖ	\Pi, \pi, \varpi	Ω, ω	\Omega, \omega

Miscellaneous Characters & Punctuation

ϝ	\digamma	∁	\complement	∠	\angle	ℑ	\Im	⊐	\Game
ℵ	\aleph	ℓ	\ell	∡	\measuredangle	ℜ	\Re	⊣	\Finv
ℶ	\beth	ð	\eth	∢	\sphericalangle	℧	\mho	∂	\partial
ℸ	\daleth	ℏ	\hbar	√	\surd	℘	\wp	™, ©	\trademark, \copyright
ℷ	\gimel	ℏ	\hslash	♮	\natural	ⅉ	\Bbbk	£, $	\pounds, \$
ı	\imath	⊤	\top	♯	\sharp	∅	\emptyset	◇, ◊	\diamondsuit, \lozenge
ȷ	\jmath	⊥	\bot	♭	\flat	∞	\infty	♡	\heartsuit
∇	\nabla	§	\S	△	\vartriangle	□, □	\Box, \square	♣	\clubsuit
△	\triangle	∅	\varnothing	▽	\triangledown	◇	\Diamond	♠	\spadesuit
▲	\blacktriangle	■	\blacksquare	╲	\diagdown	∃	\exists	★	\bigstar
▼	\blacktriangledown	♦	\blacklozenge	╱	\diagup	∄	\nexists		

Text Mode Miscellaneous Characters & Punctuation

ó	\'{o}	ǫ	\b{o}	ǒ	\v o	Ø, ø	\O, \o	¶	\P	£, $	\pounds, \$
ò	\`{o}	ȯ	\.{o}	ọ	\d o	Å, å	\AA, \aa	§	\S	!, ?	!,?
ö	\"{o}	ọ	\d{o}	o̧	\r o	Æ, æ	\AE, \ae	†	\dag	., ,	., ,
ô	\^{o}	ǫ	\c{o}	o̊	\H o	ß	\ss	‡	\ddag	', '	', '
õ	\~{o}	ŏ	\u{o}	o̅	\t o	ı	\i	™, ©	\trademark, \copyright	", "	'', '' or "
ō	\={o}	ő	\H{o}	o͡o	\t{oo}	ȷ	\j	®, ®	\textregistered, \circledR	:, ;	:, ;

Basic Math Mode

Alphabets

$XYX\ xyz$	XYZ\ xyz	**XYZ xyz**	\mathbf{XYZ\ xyz}	$\mathbb{XYZ}$	\mathbb{XYZ}
$XYZ\ xyz$	\mathnormal{XYZ\ xyz}	XYZ xyz	\mathsf{XYZ\ xyz}	$\mathcal{XYZ}$	\mathcal{XYZ}
$XYZ\ xyz$	\mathit{XYZ\ xyz}	XYZ xyz	\mathtt{XYZ\ xyz}	$\mathfrak{XYZ}$	\mathfrak{XYZ}
XYZ xyz	\mathrm{XYZ\ xyz}				

Spacing

xyz	xyz	Default math	$abcd$	a\!b\mspace{-3mu}c\negthinspace d	Neg. 3mu 'thin'
$x\ y\ z$	x\ y\ z	Expanded	$abcd$	a\negmedspace b\mspace{-4mu}c\negmedspace d	Neg. 4mu 'medium'
$\sin x \cos y$	\sin x\cos y	Operator	$abcd$	a\negthickspace b\mspace{-5mu}c\negthickspace d	Neg. 5mu 'thick'
$a\,b\,c\,d$	a\,b\mspace{3mu}c\thinspace d	3mu 'thin'	$a\qquad b$	ab	Width of 'xxx'
$a\:b\:c\:d$	a\:b\mspace{4mu}c\medspace d	4mu 'medium'			
$a\;b\;c\;d$	a\;b\mspace{5mu}c\thickspace d	5mu 'thick'			

Math Accents & Constructs

Note that most basic accents can be stacked. For example, `\acute{\acute{x}}` yields $\acute{\acute{x}}$. Or, `\acute{\tilde{x}}` yields $\acute{\tilde{x}}$.

$\acute{x}$	\acute{x}	$\dot{x}$	\dot{x}	$\overline{xyz}$	\overline{xyz}	$\xleftarrow[abc]{xyz}$	\xleftarrow[abc]{xyz}	$\overset{K}{\sum}$	\overset{K}{\sum}
$\grave{x}$	\grave{x}	$\ddot{x}$	\ddot{x}	$\underline{xyz}$	\underline{xyz}	$\xrightarrow[abc]{xyz}$	\xrightarrow[abc]{xyz}	$\underset{k=1}{\sum}$	\underset{k=1}{\sum}
$\bar{x}$	\bar{x}	$\check{x}$	\check{x}	$\overrightarrow{xyz}$	\overrightarrow{xyz}	$\overbrace{xyz}$	\overbrace{xyz}	$\sqrt{x}$	\sqrt{x}
$\hat{x}$	\hat{x}	$\vec{x}$	\vec{x}	$\overleftarrow{xyz}$	\overleftarrow{xyz}	$\underbrace{xyz}$	\underbrace{xyz}	$\sqrt[n]{x}$	\sqrt[n]{x}
$\tilde{x}$	\tilde{x}	$\widehat{xyz}$	\widehat{xyz}	$\overleftrightarrow{xyz}$	\overleftrightarrow{xyz}	f, f', f'	f, f', f\prime		
$\breve{x}$	\breve{x}	$\widetilde{xyz}$	\widetilde{xyz}	$\frac{abc}{xyz}$	\frac{abc}{xyz}	$\sideset{_y^x}{_k^j}\sum$	\sideset{_y^x}{_k^j}\sum		

Binary Relations

Note that you can produce according negations by either adding the `\not` command as a prefix or ordinarily by preceding the commands with 'n'. For example, `\not=` or `\neq` turns = to ≠.

<	`<`	>	`>`	=	`=`	∈	`\in`	∋	`\ni or \owns`
≤	`\leq or \le`	≥	`\geq or \ge`	≡	`\equiv`	⊢	`\vdash`	⊣	`\dashv`
≪	`\ll`	≫	`\gg`	≐	`\doteq`	|	`\mid`	∥	`\parallel`
≺	`\prec`	≻	`\succ`	∼	`\sim`	⌣	`\smile`	⌢	`\frown`
⪯	`\preceq`	⪰	`\succeq`	≃	`\simeq`	∃	`\exists`	¬	`\lnot or \neg`
⊂	`\subset`	⊃	`\supset`	≈	`\approx`	⊨	`\models`	⊥	`\perp`
⊆	`\subseteq`	⊇	`\supseteq`	≅	`\cong`	≍	`\asymp`	∝	`\propto`
⊏	`\sqsubset`	⊐	`\sqsupset`	⋈	`Join`	≠	`\neq`	∀	`\forall`
⊑	`\sqsubseteq`	⊒	`\sqsupseteq`	⋈	`\bowtie`	∉	`\notin`	′, ‵	`\prime, \backprime`

...

Binary Operators

Standard Operators

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

Large Operators

∑	`\sum`	∫	`\int`	∭	`\iiint`	⋂	`\bigcap`	⨁	`\bigoplus`	⋁	`bigvee`
∏	`\prod`	∮	`\oint`	⨌	`\iiiint`	⋃	`\bigcup`	⨂	`\bigotimes`	⋀	`\bigwedge`
∐	`\coprod`	∬	`\iint`			⨄	`\bigoplus`	⨀	`\bigodot`	⊔	`\bigsqcup`

Functions

arccos	`\arccoss`	csc	`\csc`	inj lim	`\injlim`	max	`\max`	tan	`\tan`
arcsin	`\arcsin`	deg	`\deg`	ker	`\ker`	min	`\min`	tanh	`\tanh`
arctan	`\arctan`	det	`\det`	lg	`\lg`	Pr	`\Pr`	$\varinjlim$	`\varinjlim`
arg	`\arg`	dim	`\dim`	lim	`\lim`	proj lim	`\projlim`	$\varprojlim$	`\varprojlim`
cos	`\cos`	exp	`\exp`	lim inf	`\liminf`	sec	`\sec`	$\varliminf$	`\varliminf`
cosh	`\cosh`	gcd	`\gcd`	lim sup	`\limsup`	sin	`\sin`	$\varlimsup$	`\varlimsup`
cot	`\cot`	hom	`\hom`	ln	`\ln`	sinh	`\sinh`	226_0^1	`\operatorname{226}_0^1`
coth	`\coth`	inf	`\inf`	log	`\log`	sup	`sup`		

...

Delimiters

Note that you can produce according relatively sized symbols by preceding the commands with `\left` or `\right`. For example, `\left(\frac{abc}{xyz}\right)` turns $\left(\frac{abc}{xyz}\right)$ to $\left(\frac{abc}{xyz}\right)$. Sometimes commands can be preceded with 'l' or 'r' e.g., `\lVert xyz\rVert` makes $\|xyz\|$. Thus, giving the `\Vert` command properties of paired symbols.
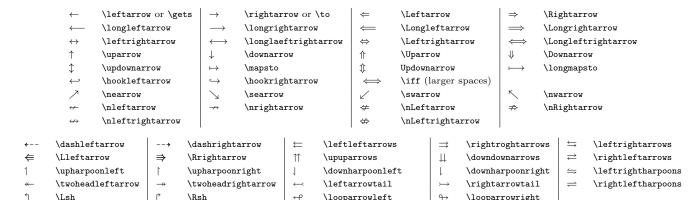
Standard Delimiters

(	`(`	[	`\lbrack or [`	⟨	`\langle`	⌊	`\lfloor`	⌜	`\ulcorner`	↑	`\uparrow`
)	`)`	]	`\rbrack or ]`	⟩	`\rangle`	⌈	`\lceil`	⌝	`\urcorner`	↓	`\downarrow`
|	`\vert or |`	{	`\lbrace or \{`	⌈	`\lceil`	/	`/`	⌞	`\llcorner`	⇑	`\Uparrow`
‖	`\Vert or |`	}	`\rbrace or \}`	⌊	`\lfloor`	\	`\backslash`	⌟	`\rcorner`	⇓	`\Downarrow`

Large Delimiters

⎱	`\lgroup`	⎰	`\rgroup`	⎧	`\lmoustache`	⎭	`\rmoustache`	|	`\arrowvert`	‖	`\Arrowvert`	‖	`\bracevert`

Arrows

←	`\leftarrow or \gets`	→	`\rightarrow or \to`	⇐	`\Leftarrow`	⇒	`\Rightarrow`
⟵	`\longleftarrow`	⟶	`\longrightarrow`	⟸	`\Longleftarrow`	⟹	`\Longrightarrow`
↔	`\leftrightarrow`	⟷	`\longlaeftrightarrow`	⇔	`\Leftrightarrow`	⟺	`\Longleftrightarrow`
↑	`\uparrow`	↓	`\downarrow`	⇑	`\Uparrow`	⇓	`\Downarrow`
↕	`\updownarrow`	↦	`\mapsto`	⇕	`Updownarrow`	⟼	`\longmapsto`
↩	`\hookleftarrow`	↪	`\hookrightarrow`	⟺	`\iff (larger spaces)`		
↗	`\nearrow`	↘	`\searrow`	↙	`\swarrow`	↖	`\nwarrow`
↚	`\nleftarrow`	↛	`\nrightarrow`	⇍	`\nLeftarrow`	⇏	`\nRightarrow`
↮	`\nleftrightarrow`			⇎	`\nLeftrightarrow`		

←--	`\dashleftarrow`	--→	`\dashrightarrow`	⇇	`\leftleftarrows`	⇉	`\rightroghtarrows`	⇆	`\leftrightarrows`
⇚	`\Lleftarrow`	⇛	`\Rrightarrow`	⇈	`\upuparrows`	⇊	`\downdownarrows`	⇄	`\rightleftarrows`
↿	`\upharpoonleft`	↾	`\upharpoonright`	⇃	`\downharpoonleft`	⇂	`\downharpoonright`	⇋	`\leftrightharpoons`
↞	`\twoheadleftarrow`	↠	`\twoheadrightarrow`	↢	`\leftarrowtail`	↣	`\rightarrowtail`	⇌	`\rightleftharpoons`
↰	`\Lsh`	↱	`\Rsh`	↫	`\looparrowleft`	↬	`\looparrowright`		
↶	`\curvearrowleft`	↷	`\curvearrowright`	↺	`\circlearrowleft`	↻	`\circlearrowright`		
⇝	`\leadsto`	⇝	`\rightsquigarrow`	↭	`\leftrightsquigarrow`	⊸	`\multimap`		

Matrices & Arrays

Note that any of the following can also be displayed inline as well as stand-alone. It's recommended that you use `smallmatrix` for this. Thus, you must preceed and succeed `\begin` and `\end smallmatrix` with `\left<delimiter>` and `\right<delimiter>`, respectively. For example, `\left(\begin{smallmatrix}a & b & c\\x & y & z\end{smallmatrix}\right)` yields $\left(\begin{smallmatrix}a & b & c\\x & y & z\end{smallmatrix}\right)$.

Basic Syntax

$$\begin{matrix} a & b & c \\ x & y & z \end{matrix}$$
```
\begin{matrix}
a & b & c\\
x & y & z
\end{matrix}
```

$$\begin{pmatrix} a & b & c \\ x & y & z \end{pmatrix}$$
```
\begin{pmatrix}
a & b & c\\
x & y & z
\end{pmatrix}
```

$$\begin{bmatrix} a & b & c \\ x & y & z \end{bmatrix}$$
```
\begin{bmatrix}
a & b & c\\
x & y & z
\end{bmatrix}
```

$$\begin{Bmatrix} a & b & c \\ x & y & z \end{Bmatrix}$$
```
\begin{Bmatrix}
a & b & c\\
x & y & z
\end{Bmatrix}
```

$$\begin{vmatrix} a & b & c \\ x & y & z \end{vmatrix}$$
```
\begin{vmatrix}
a & b & c\\
x & y & z
\end{vmatrix}
```

$$\begin{Vmatrix} a & b & c \\ x & y & z \end{Vmatrix}$$
```
\begin{Vmatrix}
a & b & c\\
x & y & z
\end{Vmatrix}
```

$$\left\lceil\begin{matrix} a & b & c \\ x & y & z \end{matrix}\right\rceil$$
```
\left\lceil\begin{matrix}
a & b & c\\
x & y & z
\left\rceil\end{matrix}
```

$$\left\langle\begin{pmatrix} a & b & c \\ x & y & z \end{pmatrix}\right\Vert$$
```
\left\langle\begin{matrix}
a & b & c\\
x & y & z
\right\Vert\end{pmatrix}
```

Dots

$\ldots$	`\dots or \ldots`	$\cdots$	`\cdots`	$\ddots$	`\ddots`	$\vdots$	`\vdots`

Array Environment

Note that arrays operate in the same manner as tables such that they permit column alignment `l`, `c` and `r` etc., columns can be divided using pipes (|) new row lines with \\, and the use of `\hline`, to name a few examples. Columns are separated the same as within tables; with $(n-1)$ `&` ampersand symbols, for n columns. Some simple examples follow.

$$\begin{array}{lcr} a & b & c \\ x & y & z \\ k & j & i \end{array}$$
```
\begin{array}{lcr}
a & b & c\\
x & y & z\\
k & j & i
\end{array}
```

$$\begin{array}{lcr} a & b & c \\ \hline x & y & z \\ \hline k & j & i \end{array}$$
```
\begin{array}{lcr}
a & b & c\\
x & y & z\\
k & j & i
\end{array}
```

$$\left(\begin{array}{cc} 2\tau & 7\phi-\frac{5}{12} \\ 3\psi & \frac{\pi}{8} \end{array}\right) \text{ and } \left[\begin{array}{cc|r} 3 & 4 & 5 \\ 1 & 3 & 729 \end{array}\right]$$
```
\left(\begin{array}{cc}
2\tau & 7\phi-\frac{5}{12}\\
3\psi & \frac{\pi}{8}
\end{array}\right)
\mbox{~and~}
\left[\begin{array}{cc|r}
3 & 4 & 5\\
1 & 3 & 729
\end{array}\right]
```

$$f(z) = \left\{ \begin{array}{rcl} z^2+\cos z & \text{for} & k\leq 3 \\ 0 & \text{for} & j\leq 5 \\ \sin\bar{z} & \text{for} & i\leq 7 \end{array} \right.$$
```
f(z)=\left\{\begin{array}{rcl}
z^2+\cos z & \mbox{for} & k\leq3\\
0 & \mbox{for} & j\leq5\\
\sin\bar{z} & \mbox{for} & i\leq7
\end{array}\right.
```

Relative Font Sizes

Math Mode

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$
`\displaystyle x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}`

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
`\textstyle x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}`

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
`\scriptstyle x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}`

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
`\scriptscriptstyle x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}`

Text Mode

tiny	`\tiny{tiny}`	normal	`\normalsize{normal}`	huge	`\huge{huge}`
script	`\scriptsize{script}`	large	`\large{large}`		
footnote	`\footnotesize{footnote}`	Large	`\Large{Large}`	Huge	`\Huge{Huge}`
small	`\small{small}`	LARGE	`\LARGE{LARGE}`		