LaTeX Mathematical Symbols

The more unusual symbols are not defined in base LaTeX (NFSS) and require `\usepackage{amssymb}`

1 Greek and Hebrew letters

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

2 LaTeX math constructs

$\frac{abc}{xyz}$	\frac{abc}{xyz}	$\overline{abc}$	\overline{abc}	$\overrightarrow{abc}$	\overrightarrow{abc}
f'	f'	$\underline{abc}$	\underline{abc}	$\overleftarrow{abc}$	\overleftarrow{abc}
$\sqrt{abc}$	\sqrt{abc}	$\widehat{abc}$	\widehat{abc}	$\overbrace{abc}$	\overbrace{abc}
$\sqrt[n]{abc}$	\sqrt[n]{abc}	$\widetilde{abc}$	\widetilde{abc}	$\underbrace{abc}$	\underbrace{abc}

3 Delimiters

$\vert$	\vert	$\{$	\{	$\lfloor$	\lfloor	/	/	$\Uparrow$	\Uparrow	$\llcorner$	\llcorner
$\vert$	\vert	$\}$	\}	$\rfloor$	\rfloor	$\backslash$	\backslash	$\uparrow$	\uparrow	$\lrcorner$	\lrcorner
$\Vert$	\Vert	$\langle$	\langle	$\lceil$	\lceil	[	[	$\Downarrow$	\Downarrow	$\ulcorner$	\ulcorner
$\Vert$	\Vert	$\rangle$	\rangle	$\rceil$	\rceil	]	]	$\downarrow$	\downarrow	$\urcorner$	\urcorner

Use the pair `\left`s_1 and `\right`s_2 to match height of delimiters s_1 and s_2 to the height of their contents, e.g., `\left|` *expr* `\right|` $\left|expr\right|$ `\left\{` *expr* `\right\}` $\left\{expr\right\}$ `\left\Vert` *expr* `\right.` $\left\Vert expr \right.$

4 Variable-sized symbols (displayed formulae show larger version)

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

5 Standard Function Names

Function names should appear in Roman, not Italic, e.g.,

Correct: `\tan(at-n\pi)` $\longrightarrow \tan(at - n\pi)$
Incorrect: `tan(at-n\pi)` $\longrightarrow tan(at - n\pi)$

arccos	\arccos	arcsin	\arcsin	arctan	\arctan	arg	\arg
cos	\cos	cosh	\cosh	cot	\cot	coth	\coth
csc	\csc	deg	\deg	det	\det	dim	\dim
exp	\exp	gcd	\gcd	hom	\hom	inf	\inf
ker	\ker	lg	\lg	lim	\lim	lim inf	\liminf
lim sup	\limsup	ln	\ln	log	\log	max	\max
min	\min	Pr	\Pr	sec	\sec	sin	\sin
sinh	\sinh	sup	\sup	tan	\tan	tanh	\tanh

6 Binary Operation/Relation Symbols

$*$ \ast	$\pm$ \pm	$\cap$ \cap	$\lhd$ \lhd
$\star$ \star	$\mp$ \mp	$\cup$ \cup	$\rhd$ \rhd
$\cdot$ \cdot	$\amalg$ \amalg	$\uplus$ \uplus	$\triangleleft$ \triangleleft
$\circ$ \circ	$\odot$ \odot	$\sqcap$ \sqcap	$\triangleright$ \triangleright
$\bullet$ \bullet	$\ominus$ \ominus	$\sqcup$ \sqcup	$\unlhd$ \unlhd
$\bigcirc$ \bigcirc	$\oplus$ \oplus	$\wedge$ \wedge	$\unrhd$ \unrhd
$\diamond$ \diamond	$\oslash$ \oslash	$\vee$ \vee	$\bigtriangledown$ \bigtriangledown
$\times$ \times	$\otimes$ \otimes	$\dagger$ \dagger	$\bigtriangleup$ \bigtriangleup
$\div$ \div	$\wr$ \wr	$\ddagger$ \ddagger	$\setminus$ \setminus
$\cdot$ \centerdot	$\Box$ \Box	$\barwedge$ \barwedge	$\veebar$ \veebar
$\circledast$ \circledast	$\boxplus$ \boxplus	$\curlywedge$ \curlywedge	$\curlyvee$ \curlyvee
$\circledcirc$ \circledcirc	$\boxminus$ \boxminus	$\Cap$ \Cap	$\Cup$ \Cup
$\circleddash$ \circleddash	$\boxtimes$ \boxtimes	$\bot$ \bot	$\top$ \top
$\dotplus$ \dotplus	$\boxdot$ \boxdot	$\intercal$ \intercal	$\rightthreetimes$ \rightthreetimes
$\divideontimes$ \divideontimes	$\square$ \square	$\doublebarwedge$ \doublebarwedge	$\leftthreetimes$ \leftthreetimes

$\equiv$ \equiv	$\leq$ \leq	$\geq$ \geq	$\perp$ \perp
$\cong$ \cong	$\prec$ \prec	$\succ$ \succ	$\mid$ \mid
$\neq$ \neq	$\preceq$ \preceq	$\succeq$ \succeq	$\parallel$ \parallel
$\sim$ \sim	$\ll$ \ll	$\gg$ \gg	$\bowtie$ \bowtie
$\simeq$ \simeq	$\subset$ \subset	$\supset$ \supset	$\Join$ \Join
$\approx$ \approx	$\subseteq$ \subseteq	$\supseteq$ \supseteq	$\ltimes$ \ltimes
$\asymp$ \asymp	$\sqsubset$ \sqsubset	$\sqsupset$ \sqsupset	$\rtimes$ \rtimes
$\doteq$ \doteq	$\sqsubseteq$ \sqsubseteq	$\sqsupseteq$ \sqsupseteq	$\smile$ \smile
$\propto$ \propto	$\dashv$ \dashv	$\vdash$ \vdash	$\frown$ \frown
$\models$ \models	$\in$ \in	$\ni$ \ni	$\notin$ \notin

$\approxeq$ \approxeq	$\leqq$ \leqq	$\geqq$ \geqq	$\lessgtr$ \lessgtr
$\thicksim$ \thicksim	$\leqslant$ \leqslant	$\geqslant$ \geqslant	$\lesseqgtr$ \lesseqgtr
$\backsim$ \backsim	$\lessapprox$ \lessapprox	$\gtrapprox$ \gtrapprox	$\lesseqqgtr$ \lesseqqgtr
$\backsimeq$ \backsimeq	$\lll$ \lll	$\ggg$ \ggg	$\gtreqqless$ \gtreqqless
$\triangleq$ \triangleq	$\lessdot$ \lessdot	$\gtrdot$ \gtrdot	$\gtreqless$ \gtreqless
$\circeq$ \circeq	$\lesssim$ \lesssim	$\gtrsim$ \gtrsim	$\gtrless$ \gtrless
$\bumpeq$ \bumpeq	$\eqslantless$ \eqslantless	$\eqslantgtr$ \eqslantgtr	$\backepsilon$ \backepsilon
$\Bumpeq$ \Bumpeq	$\precsim$ \precsim	$\succsim$ \succsim	$\between$ \between
$\doteqdot$ \doteqdot	$\precapprox$ \precapprox	$\succapprox$ \succapprox	$\pitchfork$ \pitchfork
$\thickapprox$ \thickapprox	$\Subset$ \Subset	$\Supset$ \Supset	$\shortmid$ \shortmid
$\fallingdotseq$ \fallingdotseq	$\subseteqq$ \subseteqq	$\supseteqq$ \supseteqq	$\smallfrown$ \smallfrown
$\risingdotseq$ \risingdotseq	$\sqsubset$ \sqsubset	$\sqsupset$ \sqsupset	$\smallsmile$ \smallsmile
$\propto$ \varpropto	$\preccurlyeq$ \preccurlyeq	$\succcurlyeq$ \succcurlyeq	$\Vdash$ \Vdash
$\therefore$ \therefore	$\curlyeqprec$ \curlyeqprec	$\curlyeqsucc$ \curlyeqsucc	$\vDash$ \vDash
$\because$ \because	$\blacktriangleleft$ \blacktriangleleft	$\blacktriangleright$ \blacktriangleright	$\Vvdash$ \Vvdash
$\eqcirc$ \eqcirc	$\trianglelefteq$ \trianglelefteq	$\trianglerighteq$ \trianglerighteq	$\shortparallel$ \shortparallel
$\neq$ \neq	$\vartriangleleft$ \vartriangleleft	$\vartriangleright$ \vartriangleright	$\nshortparallel$ \nshortparallel

$\ncong$ \ncong	$\nleq$ \nleq	$\ngeq$ \ngeq	$\nsubseteq$ \nsubseteq
$\nmid$ \nmid	$\nleqq$ \nleqq	$\ngeqq$ \ngeqq	$\nsupseteq$ \nsupseteq
$\nparallel$ \nparallel	$\nleqslant$ \nleqslant	$\ngeqslant$ \ngeqslant	$\nsubseteqq$ \nsubseteqq
$\nshortmid$ \nshortmid	$\nless$ \nless	$\ngtr$ \ngtr	$\nsupseteqq$ \nsupseteqq
$\nshortparallel$ \nshortparallel	$\nprec$ \nprec	$\nsucc$ \nsucc	$\subsetneq$ \subsetneq
$\nsim$ \nsim	$\npreceq$ \npreceq	$\nsucceq$ \nsucceq	$\supsetneq$ \supsetneq
$\nVDash$ \nVDash	$\precnapprox$ \precnapprox	$\succnapprox$ \succnapprox	$\subsetneqq$ \subsetneqq
$\nvDash$ \nvDash	$\precnsim$ \precnsim	$\succnsim$ \succnsim	$\supsetneqq$ \supsetneqq
$\nvdash$ \nvdash	$\lnapprox$ \lnapprox	$\gnapprox$ \gnapprox	$\varsubsetneq$ \varsubsetneq
$\ntriangleleft$ \ntriangleleft	$\lneq$ \lneq	$\gneq$ \gneq	$\varsupsetneq$ \varsupsetneq
$\ntrianglelefteq$ \ntrianglelefteq	$\lneqq$ \lneqq	$\gneqq$ \gneqq	$\varsubsetneqq$ \varsubsetneqq
$\ntriangleright$ \ntriangleright	$\lnsim$ \lnsim	$\gnsim$ \gnsim	$\varsupsetneqq$ \varsupsetneqq
$\ntrianglerighteq$ \ntrianglerighteq	$\lvertneqq$ \lvertneqq	$\gvertneqq$ \gvertneqq	

7 Arrow symbols

$\leftarrow$	\leftarrow	$\longleftarrow$	\longleftarrow	$\uparrow$	\uparrow
$\Leftarrow$	\Leftarrow	$\Longleftarrow$	\Longleftarrow	$\Uparrow$	\Uparrow
$\rightarrow$	\rightarrow	$\longrightarrow$	\longrightarrow	$\downarrow$	\downarrow
$\Rightarrow$	\Rightarrow	$\Longrightarrow$	\Longrightarrow	$\Downarrow$	\Downarrow
$\leftrightarrow$	\leftrightarrow	$\longleftrightarrow$	\longleftrightarrow	$\updownarrow$	\updownarrow
$\Leftrightarrow$	\Leftrightarrow	$\Longleftrightarrow$	\Longleftrightarrow	$\Updownarrow$	\Updownarrow
$\mapsto$	\mapsto	$\longmapsto$	\longmapsto	$\nearrow$	\nearrow
$\hookleftarrow$	\hookleftarrow	$\hookrightarrow$	\hookrightarrow	$\searrow$	\searrow
$\leftharpoonup$	\leftharpoonup	$\rightharpoonup$	\rightharpoonup	$\swarrow$	\swarrow
$\leftharpoondown$	\leftharpoondown	$\rightharpoondown$	\rightharpoondown	$\nwarrow$	\nwarrow
$\rightleftharpoons$	\rightleftharpoons	$\leadsto$	\leadsto		
$\dashrightarrow$	\dashrightarrow	$\dashleftarrow$	\dashleftarrow	$\leftleftarrows$	\leftleftarrows
$\leftrightarrows$	\leftrightarrows	$\Lleftarrow$	\Lleftarrow	$\twoheadleftarrow$	\twoheadleftarrow
$\leftarrowtail$	\leftarrowtail	$\looparrowleft$	\looparrowleft	$\leftrightharpoons$	\leftrightharpoons
$\curvearrowleft$	\curvearrowleft	$\circlearrowleft$	\circlearrowleft	$\Lsh$	\Lsh
$\upuparrows$	\upuparrows	$\upharpoonleft$	\upharpoonleft	$\downharpoonleft$	\downharpoonleft
$\multimap$	\multimap	$\leftrightsquigarrow$	\leftrightsquigarrow	$\rightrightarrows$	\rightrightarrows
$\rightleftarrows$	\rightleftarrows	$\rightrightarrows$	\rightrightarrows	$\rightleftarrows$	\rightleftarrows
$\twoheadrightarrow$	\twoheadrightarrow	$\rightarrowtail$	\rightarrowtail	$\looparrowright$	\looparrowright
$\rightleftharpoons$	\rightleftharpoons	$\curvearrowright$	\curvearrowright	$\circlearrowright$	\circlearrowright
$\Rsh$	\Rsh	$\downdownarrows$	\downdownarrows	$\upharpoonright$	\upharpoonright
$\downharpoonright$	\downharpoonright	$\rightsquigarrow$	\rightsquigarrow		
$\nleftarrow$	\nleftarrow	$\nrightarrow$	\nrightarrow	$\nLeftarrow$	\nLeftarrow
$\nRightarrow$	\nRightarrow	$\nleftrightarrow$	\nleftrightarrow	$\nLeftrightarrow$	\nLeftrightarrow

8 Miscellaneous symbols

∞	\infty	$\forall$	\forall	$\Bbbk$	\Bbbk	$\wp$	\wp
∇	\nabla	$\exists$	\exists	$\bigstar$	\bigstar	$\angle$	\angle
∂	\partial	$\nexists$	\nexists	$\diagdown$	\diagdown	$\measuredangle$	\measuredangle
$\eth$	\eth	$\emptyset$	\emptyset	$\diagup$	\diagup	$\sphericalangle$	\sphericalangle
$\clubsuit$	\clubsuit	$\varnothing$	\varnothing	$\Diamond$	\Diamond	$\complement$	\complement
$\diamondsuit$	\diamondsuit	$\imath$	\imath	$\Finv$	\Finv	$\triangledown$	\triangledown
$\heartsuit$	\heartsuit	$\jmath$	\jmath	$\Game$	\Game	$\triangle$	\triangle
$\spadesuit$	\spadesuit	ℓ	\ell	$\hbar$	\hbar	$\vartriangle$	\vartriangle
$\cdots$	\cdots	$\iiiint$	\iiiint	$\hslash$	\hslash	$\blacklozenge$	\blacklozenge
$\vdots$	\vdots	$\iiint$	\iiint	$\lozenge$	\lozenge	$\blacksquare$	\blacksquare
$\ldots$	\ldots	$\iint$	\iint	$\mho$	\mho	$\blacktriangle$	\blacktriangle
$\ddots$	\ddots	$\sharp$	\sharp	$\prime$	\prime	$\blacktrinagledown$	\blacktrinagledown
$\Im$	\Im	$\flat$	\flat	$\square$	\square	$\backprime$	\backprime
$\Re$	\Re	$\natural$	\natural	$\surd$	\surd	$\circledS$	\circledS

9 Math mode accents

$\acute{a}$	\acute{a}	$\bar{a}$	\bar{a}	$\Acute{A}$	\Acute{\Acute{A}}	$\Bar{A}$	\Bar{\Bar{A}}
$\breve{a}$	\breve{a}	$\check{a}$	\check{a}	$\Breve{A}$	\Breve{\Breve{A}}	$\Check{A}$	\Check{\Check{A}}
$\ddot{a}$	\ddot{a}	$\dot{a}$	\dot{a}	$\Ddot{A}$	\Ddot{\Ddot{A}}	$\Dot{A}$	\Dot{\Dot{A}}
$\grave{a}$	\grave{a}	$\hat{a}$	\hat{a}	$\Grave{A}$	\Grave{\Grave{A}}	$\Hat{A}$	\Hat{\Hat{A}}
$\tilde{a}$	\tilde{a}	$\vec{a}$	\vec{a}	$\Tilde{A}$	\Tilde{\Tilde{A}}	$\Vec{A}$	\Vec{\Vec{A}}

10 Array environment, examples

Simplest version: `\begin{array}{`*cols*`}` *row*$_1$ `\\` *row*$_2$ `\\` ... *row*$_m$ `\end{array}` where *cols* includes one character [`lrc`] for each column (with optional characters `|` inserted for vertical lines) and *row*$_j$ includes character `&` a total of $(n-1)$ times to separate the n elements in the row. Examples:

```
\left( \begin{array}{cc} 2\tau & 7\phi-frac5{12} \\
          3\psi & \frac{\pi}8 \end{array} \right)
\left( \begin{array}{c} x \\ y \end{array} \right)
\mbox{~and~} \left[ \begin{array}{cc|r}
     3 & 4 & 5 \\ 1 & 3 & 729 \end{array} \right]
```

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

```
   f(z) =     \left\{ \begin{array}{rcl}
         \overline{\overline{z^2}+\cos z} & \mbox{for}
         & |z|<3 \\ 0  & \mbox{for} & 3\leq|z|\leq5 \\
         \sin\overline{z} & \mbox{for} & |z|>5
                \end{array}\right.
```

$$f(z) = \left\{ \begin{array}{rcl} \overline{\overline{z^2}+\cos z} & \text{for} & |z|<3 \\ 0 & \text{for} & 3\leq|z|\leq5 \\ \sin\overline{z} & \text{for} & |z|>5 \end{array} \right.$$

11 Other Styles (math mode only)

Caligraphic letters: `$\mathcal{A}$` etc.: $\mathcal{ABCDEFGHIJKLMNOPQRSTUVWXYZ}$

Mathbb letters: `$\mathbb{A}$` etc.: $\mathbb{ABCDEFGHIJKLMNOPQRSTUVWXYZ}$

Mathfrak letters: `$\mathfrak{A}$` etc.: $\mathfrak{ABCDEFGHIJKLMNOPQRSTUVWXYZ}\,\mathfrak{abc}\,123$

Math Sans serif letters: `$\mathsf{A}$` etc.: $\mathsf{ABCDEFGHIJKLMNOPQRSTUVWXYZ}\,\mathsf{abc}\,123$

Math bold letters: `$\mathbf{A}$` etc.: $\mathbf{ABCDEFGHIJKLMNOPQRSTUVWXYZ}\,\mathbf{abc}\,\mathbf{123}$

Math bold italic letters: define `\def\mathbhi#1{\textbf{\em #1}}` then use `$\mathbhi{A}$` etc.:
$\boldsymbol{ABCDEFGHIJKLMNOPQRSTUVWXYZ \quad abc \quad 123}$

12 Font sizes

Math Mode:

$\displaystyle \int f^{-1}(x-x_a)\,dx$	`${\displaystyle \int f^{-1}(x-x_a)\,dx}$`
$\textstyle \int f^{-1}(x-x_a)\,dx$	`${\textstyle \int f^{-1}(x-x_a)\,dx}$`
$\scriptstyle \int f^{-1}(x-x_a)\,dx$	`${\scriptstyle \int f^{-1}(x-x_a)\,dx}$`
$\scriptscriptstyle \int f^{-1}(x-x_a)\,dx$	`${\scriptscriptstyle \int f^{-1}(x-x_a)\,dx}$`

Text Mode:

`\tiny` = tiny
`\scriptsize` = very small
`\footnotesize` = smaller
`\small` = small
`\normalsize` = normal
`\large` = large
`\Large` = Large
`\LARGE` = LARGE
`\huge` = huge
`\Huge` = Huge

13 Text Mode: Accents and Symbols

ó	`\'{o}`	ö	`\"{o}`	ô	`\^{o}`	ò	`\`{o}`	õ	`\~{o}`	ō	`\={o}`	ṣ	`\d s`
ȯ	`\.{o}`	ǒ	`\u{o}`	ő	`\H{o}`	o͡o	`\t{oo}`	ǫ	`\c{o}`	ọ	`\d{o}`	ś	`\r s`
o̲	`\b{o}`	Å	`\AA`	å	`\aa`	ß	`\ss`	ı	`\i`	ȷ	`\j`	S̈	`\H s`
ø	`\o`	s͡	`\t s`	š	`\v s`	Ø	`\O`	¶	`\P`	§	`\S`		
æ	`\ae`	Æ	`\AE`	†	`\dag`	‡	`\ddag`	©	`\copyright`	£	`\pounds`		