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

|	|	{	\{	$\lfloor$	\lfloor	/	/	$\Uparrow$	\Uparrow	$\llcorner$	\llcorner
|	\vert	}	\}	$\rfloor$	\rfloor	\	\backslash	$\uparrow$	\uparrow	$\lrcorner$	\lrcorner
$\|$	\\|	$\langle$	\langle	$\lceil$	\lceil	[	[	$\Downarrow$	\Downarrow	$\ulcorner$	\ulcorner
$\|$	\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\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
$\varpropto$	\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	$\blacktriangledown$	\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}}	$\bar{\bar{A}}$	\Bar{\Bar{A}}
$\breve{a}$	\breve{a}	$\check{a}$	\check{a}	$\breve{A}$	\Breve{\Breve{A}}	$\check{\check{A}}$	\Check{\Check{A}}
$\ddot{a}$	\ddot{a}	$\dot{a}$	\dot{a}	$\ddot{A}$	\Ddot{\Ddot{A}}	$\dot{\dot{A}}$	\Dot{\Dot{A}}
$\grave{a}$	\grave{a}	$\hat{a}$	\hat{a}	$\grave{A}$	\Grave{\Grave{A}}	$\hat{\hat{A}}$	\Hat{\Hat{A}}
$\tilde{a}$	\tilde{a}	$\vec{a}$	\vec{a}	$\tilde{\tilde{A}}$	\Tilde{\Tilde{A}}	$\vec{\vec{A}}$	\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.
```

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

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.: $\mathfrak{ABCDEFGHIJKLMNOPQRSTUVWXYZabc123}$

Math Sans serif letters: `$\mathsf{A}$` etc.: $\mathsf{ABCDEFGHIJKLMNOPQRSTUVWXYZabc123}$

Math bold letters: `$\mathbf{A}$` etc.: $\mathbf{ABCDEFGHIJKLMNOPQRSTUVWXYZabc123}$

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

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}`	ŏ	`\u{o}`	ő	`\H{o}`	o͡o	`\t{oo}`	ǫ	`\c{o}`		ọ	`\d{o}`		s̊	`\r s`
o̲	`\b{o}`	Å	`\AA`	å	`\aa`	ß	`\ss`	ı	`\i`		ȷ	`\j`		s̋	`\H s`
ø	`\o`	s͡	`\t s`	š	`\v s`	Ø	`\O`	¶	`\P`		§	`\S`			
æ	`\ae`	Æ	`\AE`	†	`\dag`	‡	`\ddag`	©	`\copyright`		£	`\pounds`			