## 3.9 List of Mathematical Symbols

In the following tables you find all the symbols normally accessible from *math mode*.

To use the symbols listed in Tables 3.12–3.16[5], the package amssymb must be loaded in the preamble of the document and the AMS math fonts must be installed on the system. If the AMS package and fonts are not installed, on your system, have a look at
`CTAN:/tex-archive/macros/latex/packages/amslatex`

Table 3.1: Math Mode Accents

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $\hat{a}$ | `\hat{a}` | $\check{a}$ | `\check{a}` | $\tilde{a}$ | `\tilde{a}` | $\acute{a}$ | `\acute{a}` |
| $\grave{a}$ | `\grave{a}` | $\dot{a}$ | `\dot{a}` | $\ddot{a}$ | `\ddot{a}` | $\breve{a}$ | `\breve{a}` |
| $\bar{a}$ | `\bar{a}` | $\vec{a}$ | `\vec{a}` | $\widehat{A}$ | `\widehat{A}` | $\widetilde{A}$ | `\widetilde{A}` |

Table 3.2: Lowercase Greek Letters

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $\alpha$ | `\alpha` | $\theta$ | `\theta` | $o$ | `o` | $\upsilon$ | `\upsilon` |
| $\beta$ | `\beta` | $\vartheta$ | `\vartheta` | $\pi$ | `\pi` | $\phi$ | `\phi` |
| $\gamma$ | `\gamma` | $\iota$ | `\iota` | $\varpi$ | `\varpi` | $\varphi$ | `\varphi` |
| $\delta$ | `\delta` | $\kappa$ | `\kappa` | $\rho$ | `\rho` | $\chi$ | `\chi` |
| $\epsilon$ | `\epsilon` | $\lambda$ | `\lambda` | $\varrho$ | `\varrho` | $\psi$ | `\psi` |
| $\varepsilon$ | `\varepsilon` | $\mu$ | `\mu` | $\sigma$ | `\sigma` | $\omega$ | `\omega` |
| $\zeta$ | `\zeta` | $\nu$ | `\nu` | $\varsigma$ | `\varsigma` | | |
| $\eta$ | `\eta` | $\xi$ | `\xi` | $\tau$ | `\tau` | | |

Table 3.3: Uppercase Greek Letters

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Gamma$ | `\Gamma` | $\Lambda$ | `\Lambda` | $\Sigma$ | `\Sigma` | $\Psi$ | `\Psi` |
| $\Delta$ | `\Delta` | $\Xi$ | `\Xi` | $\Upsilon$ | `\Upsilon` | $\Omega$ | `\Omega` |
| $\Theta$ | `\Theta` | $\Pi$ | `\Pi` | $\Phi$ | `\Phi` | | |

[5]These tables were derived from `symbols.tex` by David Carlisle and subsequently changed extensively as suggested by Josef Tkadlec

Table 3.4: Binary Relations

You can produce corresponding negations by adding a `\not` command as prefix to the following symbols.

| | | | | | |
|---|---|---|---|---|---|
| $<$ | `<` | $>$ | `>` | $=$ | `=` |
| $\leq$ | `\leq` or `\le` | $\geq$ | `\geq` or `\ge` | $\equiv$ | `\equiv` |
| $\ll$ | `\ll` | $\gg$ | `\gg` | $\doteq$ | `\doteq` |
| $\prec$ | `\prec` | $\succ$ | `\succ` | $\sim$ | `\sim` |
| $\preceq$ | `\preceq` | $\succeq$ | `\succeq` | $\simeq$ | `\simeq` |
| $\subset$ | `\subset` | $\supset$ | `\supset` | $\approx$ | `\approx` |
| $\subseteq$ | `\subseteq` | $\supseteq$ | `\supseteq` | $\cong$ | `\cong` |
| $\sqsubset$ [a] | `\sqsubset` [a] | $\sqsupset$ [a] | `\sqsupset` [a] | $\bowtie$ [a] | `\Join` [a] |
| $\sqsubseteq$ | `\sqsubseteq` | $\sqsupseteq$ | `\sqsupseteq` | $\bowtie$ | `\bowtie` |
| $\in$ | `\in` | $\ni$ | `\ni` , `\owns` | $\propto$ | `\propto` |
| $\vdash$ | `\vdash` | $\dashv$ | `\dashv` | $\models$ | `\models` |
| $\mid$ | `\mid` | $\parallel$ | `\parallel` | $\perp$ | `\perp` |
| $\smile$ | `\smile` | $\frown$ | `\frown` | $\asymp$ | `\asymp` |
| $:$ | `:` | $\notin$ | `\notin` | $\neq$ | `\neq` or `\ne` |

[a] Use the latexsym package to access this symbol

Table 3.5: Binary Operators

| | | | | | |
|---|---|---|---|---|---|
| $+$ | `+` | $-$ | `-` | | |
| $\pm$ | `\pm` | $\mp$ | `\mp` | $\triangleleft$ | `\triangleleft` |
| $\cdot$ | `\cdot` | $\div$ | `\div` | $\triangleright$ | `\triangleright` |
| $\times$ | `\times` | $\setminus$ | `\setminus` | $\star$ | `\star` |
| $\cup$ | `\cup` | $\cap$ | `\cap` | $*$ | `\ast` |
| $\sqcup$ | `\sqcup` | $\sqcap$ | `\sqcap` | $\circ$ | `\circ` |
| $\vee$ | `\vee` , `\lor` | $\wedge$ | `\wedge` , `\land` | $\bullet$ | `\bullet` |
| $\oplus$ | `\oplus` | $\ominus$ | `\ominus` | $\diamond$ | `\diamond` |
| $\odot$ | `\odot` | $\oslash$ | `\oslash` | $\uplus$ | `\uplus` |
| $\otimes$ | `\otimes` | $\bigcirc$ | `\bigcirc` | $\amalg$ | `\amalg` |
| $\bigtriangleup$ | `\bigtriangleup` | $\bigtriangledown$ | `\bigtriangledown` | $\dagger$ | `\dagger` |
| $\lhd$ [a] | `\lhd` [a] | $\rhd$ [a] | `\rhd` [a] | $\ddagger$ | `\ddagger` |
| $\unlhd$ [a] | `\unlhd` [a] | $\unrhd$ [a] | `\unrhd` [a] | $\wr$ | `\wr` |

Table 3.6: BIG Operators

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

Table 3.7: Arrows

| | | | | | |
|---|---|---|---|---|---|
| $\leftarrow$ | `\leftarrow` or `\gets` | $\longleftarrow$ | `\longleftarrow` | $\uparrow$ | `\uparrow` |
| $\rightarrow$ | `\rightarrow` or `\to` | $\longrightarrow$ | `\longrightarrow` | $\downarrow$ | `\downarrow` |
| $\leftrightarrow$ | `\leftrightarrow` | $\longleftrightarrow$ | `\longleftrightarrow` | $\updownarrow$ | `\updownarrow` |
| $\Leftarrow$ | `\Leftarrow` | $\Longleftarrow$ | `\Longleftarrow` | $\Uparrow$ | `\Uparrow` |
| $\Rightarrow$ | `\Rightarrow` | $\Longrightarrow$ | `\Longrightarrow` | $\Downarrow$ | `\Downarrow` |
| $\Leftrightarrow$ | `\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` | $\iff$ | `\iff` (bigger spaces) | $\leadsto$ [a] | `\leadsto` [a] |

[a] Use the latexsym package to access this symbol

Table 3.8: Delimiters

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $($ | `(` | $)$ | `)` | $\uparrow$ | `\uparrow` | $\Uparrow$ | `\Uparrow` |
| $[$ | `[` or `\lbrack` | $]$ | `]` or `\rbrack` | $\downarrow$ | `\downarrow` | $\Downarrow$ | `\Downarrow` |
| $\{$ | `\{` or `\lbrace` | $\}$ | `\}` or `\rbrace` | $\updownarrow$ | `\updownarrow` | $\Updownarrow$ | `\Updownarrow` |
| $\langle$ | `\langle` | $\rangle$ | `\rangle` | $\vert$ | `\|` or `\vert` | $\Vert$ | `\\|` or `\Vert` |
| $\lfloor$ | `\lfloor` | $\rfloor$ | `\rfloor` | $\lceil$ | `\lceil` | $\rceil$ | `\rceil` |
| $/$ | `/` | $\backslash$ | `\backslash` | | . (dual. empty) | | |

Table 3.9: Large Delimiters

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $\lgroup$ | `\lgroup` | $\rgroup$ | `\rgroup` | $\lmoustache$ | `\lmoustache` | $\rmoustache$ | `\rmoustache` |
| $\arrowvert$ | `\arrowvert` | $\Arrowvert$ | `\Arrowvert` | $\bracevert$ | `\bracevert` | | |

Table 3.10: Miscellaneous Symbols

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $\dots$ | \dots | $\cdots$ | \cdots | $\vdots$ | \vdots | $\ddots$ | \ddots |
| $\hbar$ | \hbar | $\imath$ | \imath | $\jmath$ | \jmath | $\ell$ | \ell |
| $\Re$ | \Re | $\Im$ | \Im | $\aleph$ | \aleph | $\wp$ | \wp |
| $\forall$ | \forall | $\exists$ | \exists | $\mho$ [a] | \mho [a] | $\partial$ | \partial |
| $'$ | ' | $\prime$ | \prime | $\emptyset$ | \emptyset | $\infty$ | \infty |
| $\nabla$ | \nabla | $\triangle$ | \triangle | $\Box$ [a] | \Box [a] | $\Diamond$ [a] | \Diamond [a] |
| $\bot$ | \bot | $\top$ | \top | $\angle$ | \angle | $\surd$ | \surd |
| $\diamondsuit$ | \diamondsuit | $\heartsuit$ | \heartsuit | $\clubsuit$ | \clubsuit | $\spadesuit$ | \spadesuit |
| $\neg$ | \neg or \lnot | $\flat$ | \flat | $\natural$ | \natural | $\sharp$ | \sharp |

[a] Use the latexsym package to access this symbol

Table 3.11: Non-Mathematical Symbols

These symbols can also be used in text mode.

| | | | | | |
|---|---|---|---|---|---|
| † | \dag | § | \S | © | \copyright |
| ‡ | \ddag | ¶ | \P | £ | \pounds |

Table 3.12: AMS Delimiters

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ⌜ | \ulcorner | ⌝ | \urcorner | ⌞ | \llcorner | ⌟ | \lrcorner |

Table 3.13: AMS Greek and Hebrew

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $\digamma$ | \digamma | $\varkappa$ | \varkappa | ב | \beth | ד | \daleth | ג | \gimel |

Table 3.14: AMS Binary Relations

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

Table 3.15: AMS Arrows

| | | | | | |
|---|---|---|---|---|---|
| $\dashleftarrow$ | \dashleftarrow | $\dashrightarrow$ | \dashrightarrow | $\multimap$ | \multimap |
| $\leftleftarrows$ | \leftleftarrows | $\rightrightarrows$ | \rightrightarrows | $\upuparrows$ | \upuparrows |
| $\leftrightarrows$ | \leftrightarrows | $\rightleftarrows$ | \rightleftarrows | $\downdownarrows$ | \downdownarrows |
| $\Lleftarrow$ | \Lleftarrow | $\Rrightarrow$ | \Rrightarrow | $\upharpoonleft$ | \upharpoonleft |
| $\twoheadleftarrow$ | \twoheadleftarrow | $\twoheadrightarrow$ | \twoheadrightarrow | $\upharpoonright$ | \upharpoonright |
| $\leftarrowtail$ | \leftarrowtail | $\rightarrowtail$ | \rightarrowtail | $\downharpoonleft$ | \downharpoonleft |
| $\leftrightharpoons$ | \leftrightharpoons | $\rightleftharpoons$ | \rightleftharpoons | $\downharpoonright$ | \downharpoonright |
| $\Lsh$ | \Lsh | $\Rsh$ | \Rsh | $\rightsquigarrow$ | \rightsquigarrow |
| $\looparrowleft$ | \looparrowleft | $\looparrowright$ | \looparrowright | $\leftrightsquigarrow$ | \leftrightsquigarrow |
| $\curvearrowleft$ | \curvearrowleft | $\curvearrowright$ | \curvearrowright | | |
| $\circlearrowleft$ | \circlearrowleft | $\circlearrowright$ | \circlearrowright | | |

Table 3.16: AMS Negated Binary Relations and Arrows

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

Table 3.17: AMS Binary Operators

| | | | | | |
|---|---|---|---|---|---|
| $\dotplus$ | \dotplus | $\centerdot$ | \centerdot | $\intercal$ | \intercal |
| $\ltimes$ | \ltimes | $\rtimes$ | \rtimes | $\divideontimes$ | \divideontimes |
| $\Cup$ | \Cup or \doublecup | $\Cap$ | \Cap or \doublecap | $\smallsetminus$ | \smallsetminus |
| $\veebar$ | \veebar | $\barwedge$ | \barwedge | $\doublebarwedge$ | \doublebarwedge |
| $\boxplus$ | \boxplus | $\boxminus$ | \boxminus | $\circleddash$ | \circleddash |
| $\boxtimes$ | \boxtimes | $\boxdot$ | \boxdot | $\circledcirc$ | \circledcirc |
| $\leftthreetimes$ | \leftthreetimes | $\rightthreetimes$ | \rightthreetimes | $\circledast$ | \circledast |
| $\curlyvee$ | \curlyvee | $\curlywedge$ | \curlywedge | | |

Table 3.18: AMS Miscellaneous

| | | | | | |
|---|---|---|---|---|---|
| $\hbar$ | `\hbar` | $\hslash$ | `\hslash` | $\Bbbk$ | `\Bbbk` |
| $\square$ | `\square` | $\blacksquare$ | `\blacksquare` | Ⓢ | `\circledS` |
| $\vartriangle$ | `\vartriangle` | $\blacktriangle$ | `\blacktriangle` | $\complement$ | `\complement` |
| $\triangledown$ | `\triangledown` | $\blacktriangledown$ | `\blacktriangledown` | $\Game$ | `\Game` |
| $\lozenge$ | `\lozenge` | $\blacklozenge$ | `\blacklozenge` | $\bigstar$ | `\bigstar` |
| $\angle$ | `\angle` | $\measuredangle$ | `\measuredangle` | $\sphericalangle$ | `\sphericalangle` |
| $\diagup$ | `\diagup` | $\diagdown$ | `\diagdown` | $\backprime$ | `\backprime` |
| $\nexists$ | `\nexists` | $\Finv$ | `\Finv` | $\varnothing$ | `\varnothing` |
| $\eth$ | `\eth` | $\mho$ | `\mho` | | |

Table 3.19: Math Alphabets

| Example | Command | Required package |
|---|---|---|
| ABCdef | `\mathrm{ABCdef}` | |
| $ABCdef$ | `\mathit{ABCdef}` | |
| $ABCdef$ | `\mathnormal{ABCdef}` | |
| $\mathcal{ABC}$ | `\mathcal{ABC}` | |
| $\mathscr{ABC}$ | `\mathcal{ABC}` | mathrsfs |
| $\mathcal{ABC}$ | `\mathcal{ABC}` | eucal with option: mathcal or |
| | `\mathscr{ABC}` | eucal with option: mathscr |
| $\mathfrak{ABCdef}$ | `\mathfrak{ABCdef}` | eufrak |
| $\mathbb{ABC}$ | `\mathbb{ABC}` | amsfonts or amssymb |