Mathematical Symbols and Special Characters in LaTeX: Commands and Their Meanings

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Contents

1 Libraries

Library	Command
amssymb	`\usepackage{amssymb}`
float	`\usepackage{float}`
graphicx	`\usepackage{graphicx}\UseRawInputEncoding`
hyperref	`\usepackage{hyperref}`
inputenc	`\usepackage[utf8]{inputenc}`
lscape	`\usepackage{lscape}`
mathtools	`\usepackage{mathtools}`
verbatim	`\usepackage{verbatim}`

Table 1: Libraries and commands

2 Mathematical symbols

2.1 Greek letters

Symbol	Command	Meaning
A	`$\mathrm{A}$`	uppercase alpha
α	`$\alpha$`	lowercase alpha
B	`$\mathrm{B}$`	uppercase beta
β	`$\beta$`	lowercase beta
Γ	`$\Gamma$`	uppercase gamma
γ	`$\gamma$`	lowercase gamma
Δ	`$\Delta$`	uppercase delta
δ	`$\delta$`	lowercase delta
E	`$\mathrm{E}$`	uppercase epsilon
ϵ	`$\epsilon$`	lowercase epsilon
ε	`$\varepsilon$`	lowercase epsilon
Z	`$\mathrm{Z}$`	uppercase zeta
ζ	`$\zeta$`	lowercase zeta
H	`$\mathrm{H}$`	uppercase eta
η	`$\eta$`	lowercase eta
Θ	`$\Theta$`	uppercase theta
θ	`$\theta$`	lowercase theta
ϑ	`$\vartheta$`	lowercase theta
K	`$\mathrm{K}$`	uppercase kappa
κ	`$\kappa$`	lowercase kappa
$\varkappa$	`$\varkappa$`	lowercase kappa

Table 2: Greek letters, commands and meanings (part 1)

Symbol	Command	Meaning
I	`$\mathrm{I}$`	uppercase iota
ι	`$\iota$`	lowercase iota
Λ	`$\Lambda$`	uppercase lambda
λ	`$\lambda$`	lowercase lambda
M	`$\mathrm{M}$`	uppercase mu
μ	`$\mu$`	lowercase mu
N	`$\mathrm{N}$`	uppercase nu
ν	`$\nu$`	lowercase nu
Ξ	`$\Xi$`	uppercase xi
ξ	`$\xi$`	lowercase xi
O	`$\mathrm{O}$`	uppercase omicron
o	`$\mathrm{o}$`	lowercase omicron
Π	`$\Pi$`	uppercase pi
π	`$\pi$`	lowercase pi
ϖ	`$\varpi$`	lowercase pi
P	`$\mathrm{P}$`	uppercase rho
ρ	`$\rho$`	lowercase rho
ϱ	`$\varrho$`	lowercase rho
Σ	`$\Sigma$`	uppercase sigma
σ	`$\sigma$`	lowercase sigma
ς	`$\varsigma$`	lowercase sigma
T	`$\mathrm{T}$`	uppercase tau
τ	`$\tau$`	lowercase tau
Υ	`$\Upsilon$`	uppercase upsilon
υ	`$\upsilon$`	lowercase upsilon
Φ	`$\Phi$`	uppercase phi
ϕ	`$\phi$`	lowercase phi
φ	`$\varphi$`	lowercase phi
X	`$\mathrm{X}$`	uppercase chi
χ	`$\chi$`	lowercase chi
Ψ	`$\Psi$`	uppercase psi
ψ	`$\psi$`	lowercase psi
Ω	`$\Omega$`	uppercase omega
ω	`$\omega$`	lowercase omega

Table 3: Greek letters, commands and meanings (part 2)

2.2 Arrows

Symbol	Command	Meaning
$\leftarrow$	`$\gets$`	left arrow / gets
$\Leftarrow$	`$\Leftarrow$`	double left arrow
$\longleftarrow$	`$\longleftarrow$`	long left arrow
$\Longleftarrow$	`$\Longleftarrow$`	long double left arrow
$\rightarrow$	`$\to$`	right arrow / to
$\Rightarrow$	`$\Rightarrow$`	double right arrow
$\longrightarrow$	`$\longrightarrow$`	long right arrow
$\Longrightarrow$	`$\Longrightarrow$`	long double right arrow
$\mapsto$	`$\mapsto$`	maps to
$\longmapsto$	`$\longmapsto$`	long maps to
$\uparrow$	`$\uparrow$`	up arrow
$\Uparrow$	`$\Uparrow$`	double up arrow
$\downarrow$	`$\downarrow$`	down arrow
$\Downarrow$	`$\Downarrow$`	double down arrow
$\updownarrow$	`$\updownarrow$`	up down arrow
$\Updownarrow$	`$\Updownarrow$`	double up down arrow

Table 4: Arrows, commands and meanings

2.3 Delimiters

Symbol	Command	Meaning
$\vert$	`$\vert$`	divides
$\Vert$	`$\parallel$`	divides unilaterally, is parallel with
$($	`$($`	left/opening parenthesis
$)$	`$)$`	right/closing parenthesis
$[$	`$[$`	left/opening square bracket
$]$	`$]$`	right/closing square bracket
$\{$	`$\{$`	left/opening curly brace
$\}$	`$\}$`	right/closing curly brace
$\lceil$	`$\lceil$`	left ceiling
$\rceil$	`$\rceil$`	right ceiling
$\langle$	`$\langle$`	left/opening angle bracket
$\rangle$	`$\rangle$`	right/closing angle bracket
$\lfloor$	`$\lfloor$`	left floor
$\rfloor$	`$\rfloor$`	right floor
$\ulcorner$	`$\ulcorner$`	upper left corner
$\urcorner$	`$\urcorner$`	upper right corner
$\llcorner$	`$\llcorner$`	lower left corner
$\lrcorner$	`$\lrcorner$`	lower right corner
$/$	`$/$`	forward slash
$\backslash$	`$\backslash$`	back slash

Table 5: Delimiters, commands and meanings

2.4 Unary operators

Symbol	Command	Meaning
$+$	`$+$`	expansion
$-$	`$-$`	contraction
$\neg$	`$\neg$`	negation
$!$	`$!$`	factorial
$\#$	`$\#$`	primordial

Table 6: Unary operators, commands and meanings

2.5 Relation operators

Symbol	Command	Meaning
$<$	`$<$`	is less than
$\not<$	`$\nless$`	is not less than
$\leq$	`$\leq$`	is less than or equal to
$\not\leq$	`$\nleq$`	is neither less than nor equal to
$\leqslant$	`$\leqslant$`	is less than or equal to (slanted)
$\not\leqslant$	`$\nleqslant$`	is neither less than nor equal to (slanted)
$>$	`$>$`	is greater than
$\not>$	`$\ngtr$`	is not greater than
$\geq$	`$\geq$`	is greater than or equal to
$\not\geq$	`$\ngeq$`	is neither greater than nor equal to
$\geqslant$	`$\geqslant$`	is greater than or equal to (slanted)
$\not\geqslant$	`$\ngeqslant$`	is neither greater than nor equal to (slanted)
$\prec$	`$\prec$`	precedes
$\not\prec$	`$\nprec$`	does not precede
$\preceq$	`$\preceq$`	precedes or equals
$\not\preceq$	`$\npreceq$`	neither precedes nor equals
$\succ$	`$\succ$`	succedes
$\not\succ$	`$\nsucc$`	does not succeed
$\succeq$	`$\succeq$`	succeeds or equals
$\not\succeq$	`$\nsucceq$`	neither succeeds nor equals
$=$	`$=$`	is equal to
$\neq$	`$\neq$`	is not equal to

Table 7: Relation operators, commands and meanings (part 1)

Symbol	Command	Meaning
$\equiv$	`$\equiv$`	is equivalent to
$\approx$	`$\approx$`	is approximately
$\cong$	`$\cong$`	is congruent to
$\sim$	`$\sim$`	is similar to
$\simeq$	`$\simeq$`	is similar or equal to
$\propto$	`$\propto$`	is proportional to
$\vdash$	`$\vdash$`	proves/satisfies/entails
$\nvdash$	`$\nvdash$`	does not prove/satisfy/entail
$\Vdash$	`$\Vdash$`	logically implies
$\nVdash$	`$\nVdash$`	does not logically imply
$\models$	`$\models$`	models
$\nentails$	`$\nentails$`	does not model
$\dashv$	`$\dashv$`	is proved/satisfied/entail by
$\not\dashv$	`$\not\dashv$`	is not proved/satisfied/entailed by
$\parallel$	`$\parallel$`	is parallel to
$\nparallel$	`$\nparallel$`	is not parallel to
$\asymp$	`$\asymp$`	is asymptotic to
$\perp$	`$\perp$`	is perpendicular to

Table 8: Relation operators, commands and meanings (part 2)

2.6 Binary operators

Symbol	Command	Meaning
$\pm$	`$\pm$`	plus or minus
$\mp$	`$\mp$`	minus or plus
$\times$	`$\times$`	multiplied by
$\div$	`$\div$`	divided by
$\ast$	`$\ast$`	asterisk
$\star$	`$\star$`	star
$\circ$	`$\circ$`	circle
$\bigcirc$	`$\bigcirc$`	big circle
$\cdot$	`$\cdot$`	dot
$\odot$	`$\odot$`	circle with inner dot
$\bullet$	`$\bullet$`	bullet
$\diamond$	`$\diamond$`	diamond
$\blacktriangle$	`$\blacktriangle$`	shaded triangle
$\bigtriangleup$	`$\bigtriangleup$`	big upward triangle
$\bigtriangledown$	`$\bigtriangledown$`	big downward triangle
$\triangleleft$	`$\triangleleft$`	left triangle
$\triangleright$	`$\triangleright$`	right triangle
$\oplus$	`$\oplus$`	exclusive or (xor)
$\dagger$	`$\dagger$`	dagger
$\ddagger$	`$\ddagger$`	double dagger

Table 9: Binary operators, commands and meaning

2.7 Set operators

Symbol	Command	Meaning
$\emptyset$	`$\emptyset$`	empty set
$\mathbb{N}$	`$\mathbb{N}$`	set of natural numbers
$\mathbb{Z}$	`$\mathbb{Z}$`	set of integers
$\mathbb{Q}$	`$\mathbb{Q}$`	set of rational numbers
$\mathbb{A}$	`$\mathbb{A}$`	set of algebraic numbers
$\mathbb{R}$	`$\mathbb{R}$`	set of real numbers
$\mathbb{C}$	`$\mathbb{C}$`	set of complex numbers
$\mathbb{H}$	`$\mathbb{H}$`	set of quaternions
$\mathbb{O}$	`$\mathbb{O}$`	set of octonions
$\mathbb{S}$	`$\mathbb{S}$`	set of sedenions
$\in$	`$\in$`	is a member of
$\notin$	`$\notin$`	is not a member of
$\ni$	`$\ni$`	owns, has member
$\not\ni$	`$\not\ni$`	does not own, does not have member
$\subset$	`$\subset$`	is a proper subset of
$\not\subset$	`$\not\subset$`	is not a proper subset of
$\subseteq$	`$\subseteq$`	is a subset of
$\not\subseteq$	`$\not\subseteq$`	is not a subset of
$\supset$	`$\supset$`	is a proper superset of
$\not\supset$	`$\not\supset$`	is not a proper superset of
$\supseteq$	`$\supseteq$`	is a superset of
$\not\supseteq$	`$\not\supseteq$`	is not a superset of
$\cup$	`$\cup$`	set union
$\sqcup$	`$\sqcup$`	set union (square)
$\cap$	`$\cap$`	set intersection
$\sqcap$	`$\sqcap$`	set intersection (square)
$\uplus$	`$\uplus$`	multiset addition
$\setminus$	`$\setminus$`	set difference
$\amalg$	`$\amalg$`	disjoint set union

Table 10: Set operators, commands and meanings

2.8 Logic operators

Symbol	Command	Meaning
$\exists$	`$\exists$`	there exists at least one
$\exists!$	`$\exists!$`	there exists one and only one
$\nexists$	`$\nexists$`	there does not exist
$\forall$	`$\forall$`	for all
$\neg$	`$\neg$`	negation
$\lor$	`$\lor$`	logical or
$\land$	`$\land$`	logical and
$\top$	`$\top$`	tautology / truth
$\bot$	`$\bot$`	contradiction / falsity
$\Longrightarrow$	`$\Longrightarrow$`	implies, if
$\Rightarrow$	`$\Rightarrow$`	preferred for right implication
$\Longleftarrow$	`$\Longleftarrow$`	is implied by, only if
$\Leftarrow$	`$\Leftarrow$`	preferred for left implication
$\iff$	`$\iff$`	is equivalent to, if and only if, iff
$\Leftrightarrow$	`$\Leftrightarrow$`	preferred for equivalence

Table 11: Logic operators, commands and meanings

2.9 Miscellaneous

Symbol	Command	Meaning
∞	`$\infty$`	infinity
∂	`$\partial$`	partial derivative
$\Re$	`$\Re$`	real part (complex numbers)
$\Im$	`$\Im$`	imaginary part (complex numbers
∇	`$\nabla$`	delta (vector calculus)

Table 12: Miscellaneous operators, commands and meanings