

B.1 Hebrew and Greek letters

Hebrew letters

Туре	Typeset
\aleph	Х
\beth	コ
\d	٦
\gimel	I

Greek letters

Lowercase

Туре	Typeset	Type	Typeset	Туре	Typeset
\alpha	α	\iota	ι	\sigma	σ
\beta	β	\kappa	κ	\tau	τ
\gamma	γ	\lambda	λ	\upsilon	v
\delta	δ	\mu	μ	\phi	ϕ
\epsilon	ϵ	\nu	ν	\chi	χ
\zeta	ζ	\xi	ξ	\psi	ψ
\eta	η	\pi	π	\omega	ω
\theta	θ	\rho	ρ		
\varepsilon	ε	\varpi	ϖ	\varsigma	5
\vartheta	θ	\varrho	ϱ	\varphi	φ
	\digamma	F	\varkappa	×	

Uppercase

Type	Typeset	Type	Typeset	Type	Typeset
\Gamma	Γ	\Xi	Ξ	\Phi	Φ
\Delta	Δ	\Pi	П	\Psi	Ψ
\Theta	Θ	\Sigma	Σ	\Omega	Ω
\Lambda	Λ	\Upsilon	Υ		
\varGamma	Γ	\varXi	Ξ	\varPhi	Φ
\varDelta	Δ	\varPi	П	\varPsi	Ψ
\varTheta	Θ	\varSigma	Σ	\var0mega	Ω
\varLambda	Λ	$\verb \varUpsilon $	Υ		

B.2 Binary relations

Type	Typeset	Type	Typeset
<	<	>	>
=	=	:	:
\in	\in	\ni or \owns	∋
$\leq or \leq e$	\leq	\geq or \ge	\geq
\11	«	\gg	>>
\prec	\prec	\succ	\succ
\preceq	\preceq	\succeq	≻
\sim	\sim	\approx	\approx
\simeq	\simeq	\cong	\cong
\equiv	\equiv	\doteq	÷
\subset	\subset	\supset	\supset
\subseteq	\subseteq	\supseteq	\supseteq
\sqsubseteq		\sqsupseteq	\supseteq
\smile	$\overline{}$	\frown	$\overline{}$
\perp	\perp	\models	=
\mid		\parallel	
\vdash	\vdash	\dashv	\dashv
\propto	\propto	\asymp	\simeq
\bowtie	\bowtie		
\sqsubset		\sqsupset	
\Join	×		

Note the \colon command used in $f \colon x \to x^2$, typed as

f \colon x \to x^2

More binary relations

Туре	Typeset	Туре	Typeset
\leqq	≦	\geqq	≧
\leqslant	<	\geqslant	≥
\eqslantless	<	\eqslantgtr	≽
\lesssim	≲	\gtrsim	\gtrsim
\lessapprox	≨	\gtrapprox	≳
\approxeq	\approx		
\lessdot	<	\gtrdot	>
\111	<<<	\ggg	>>>
\lessgtr	≶	\gtrless	≷
\lesseqgtr	\$	\gtreqless	\geq
\lesseqqgtr	\leq	\gtreqqless	W VIV VIIV
\doteqdot	÷	\eqcirc	=
\circeq	<u>•</u>	\triangleq	\triangleq
\risingdotseq	≓	\fallingdotseq	Έ.
\backsim	~	\thicksim	~
\backsimeq	~	\thickapprox	≈
\preccurlyeq	\preccurlyeq	\succcurlyeq	≽
\curlyeqprec	$ \preccurlyeq $	\curlyeqsucc	\Rightarrow
\precsim	≾	\succsim	≿
\precapprox	X≋	\succapprox	£
\subseteqq	\subseteq	\supseteqq	\supseteq
\Subset	€	\Supset	∍
\vartriangleleft	\triangleleft	\vartriangleright	\triangleright
\trianglelefteq	\leq	\trianglerighteq	\trianglerighteq
\vDash	F	\Vdash	I
\Vvdash	II⊢		
\smallsmile	\smile	\smallfrown	\sim
\shortmid	1	\shortparallel	11
\bumpeq	^	\Bumpeq	≎
\between	Ŏ	\pitchfork	ф
\varpropto	\propto	\backepsilon	Э
$\blue{blacktriangleleft}$	<	$\blue{blacktriangleright}$	•
\therefore		\because	

Negated binary relations

Type	Typeset	Type	Typeset
\neq or \ne	<i>≠</i>	\notin	∉
\nless	*	\ngtr	*
\nleq	≰	\ngeq	≱
\nleqslant	≰	\ngeqslant	¥
\nleqq	≨	\ngeqq	≱
\lneq	≤	\gneq	≥
\lneqq	≨	\gneqq	≩
\lvertneqq	≨	\gvertneqq	≩
\lnsim	⋦	\gnsim	⋧
\lnapprox	≨	\gnapprox	≩
\nprec	*	\nsucc	$ \neq$
\npreceq	≠	\nsucceq	⊭
\precneqq	≆	\succneqq	≨
\precnsim	$\stackrel{\prec}{\sim}$	\succnsim	⋩
\precnapprox	≈	\succnapprox	£
\nsim	~	\ncong	≇
\nshortmid	?	\nshortparallel	н
\nmid	ł	\nparallel	¥
\nvdash	¥	\nvDash	⊭
\nVdash	\mathbb{K}	\nVDash	¥
\n	⋪	\ntriangleright	$\not\!$
\n	⊉	\ntrianglerighteq	⊭
\nsubseteq	⊈	\nsupseteq	⊉
\nsubseteqq	≨	\nsupseteqq	⊉
\subsetneq	⊊	\supsetneq	⊋
\varsubsetneq	⊊	\varsupsetneq	⊋
\subsetneqq	⊊	\supsetneqq	⊋
\varsubsetneqq	≨	\varsupsetneqq	⊋

B.3 Binary operations

Туре	Typeset	Туре	Typeset
+	+	-	-
\pm	\pm	\mp	
\times	×	\cdot	
\circ	0	\bigcirc	0
\div	÷	\bmod	mod
\cap	\cap	\cup	U
\sqcap		\sqcup	\sqcup
\wedge or \land	\wedge	\vee or \lor	V
\triangleleft	⊲	\triangleright	\triangleright
\bigtriangleup	\triangle	\bigtriangledown	∇
\oplus	\oplus	\ominus	Θ
\otimes	\otimes	\oslash	0
\odot	•	\bullet	•
\dagger	†	\ddagger	‡
\setminus	\	\smallsetminus	\
\wr	2	\amalg	Π
\ast	*	\star	*
\diamond			
\1hd	⊲	\rhd	\triangleright
\unlhd	⊴	\unrhd	⊵
\dotplus	+	\centerdot	
\ltimes	K	\rtimes	\rtimes
\leftthreetimes	λ	\rightthreetimes	/
\circleddash	\odot	\uplus	\forall
\barwedge	$\overline{\wedge}$	\doublebarwedge	_
\curlywedge	人	\curlyvee	Υ
\veebar	\vee	\intercal	Т
\doublecap or \Cap		\doublecup or \Cup	U
\circledast	*	\circledcirc	0
\boxminus	\Box	\boxtimes	\boxtimes
\boxdot	•	\boxplus	\blacksquare
\divideontimes	*	\vartriangle	Δ
\And	&	-	

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B.4 Arrows

Type	Typeset	Type	Typeset
\leftarrow	←	\rightarrow or \to	\rightarrow
\longleftarrow	←	\longrightarrow	\longrightarrow
\Leftarrow	\Leftarrow	\Rightarrow	\Rightarrow
\Longleftarrow	\Leftarrow	\Longrightarrow	\Longrightarrow
\leftrightarrow	\leftrightarrow	\longleftrightarrow	\longleftrightarrow
\Leftrightarrow	\Leftrightarrow	\Longleftrightarrow	\iff
\uparrow	1	\downarrow	1
\Uparrow	1	\Downarrow	1
\updownarrow	1	\Updownarrow	1
\nearrow	7	\searrow	\
\swarrow	/	\nwarrow	_
\iff	\iff	\mapstochar	ì
\mapsto	\mapsto	\longmapsto	\longrightarrow
\hookleftarrow	\leftarrow	\hookrightarrow	\hookrightarrow
\leftharpoonup	_	\rightharpoonup	\rightarrow
\leftharpoondown	_	\rightharpoondown	\rightarrow
\leadsto	~		
\leftleftarrows	⊨	\rightrightarrows	\Rightarrow
\leftrightarrows	$\stackrel{\longleftarrow}{}$	\rightleftarrows	\rightleftharpoons
\Lleftarrow	⊭	\Rrightarrow	\Rightarrow
\twoheadleftarrow		\twoheadrightarrow	\rightarrow
\leftarrowtail	\leftarrow	\rightarrowtail	\longrightarrow
\looparrowleft	↔	\looparrowright	9
\upuparrows	$\uparrow \uparrow$	\downdownarrows	$\downarrow\downarrow$
\upharpoonleft	1	\upharpoonright	1
\downharpoonleft	j	\downharpoonright	į
\leftrightsquigarrow	***	\rightsquigarrow	~÷
\multimap	-0	0 1 0	
\nleftarrow	←	\nrightarrow	\rightarrow
\nLeftarrow	#	\nRightarrow	⇒
\nleftrightarrow	↔	\nLeftrightarrow	#
\dashleftarrow	4	\dashrightarrow	
\curvearrowleft	\sim	\curvearrowright	0
\circlearrowleft	O	\circlearrowright	Ŏ
\leftrightharpoons	⇒	\rightleftharpoons	\rightleftharpoons
\Lsh	ń	\Rsh	ľ

B.5 Miscellaneous symbols

Туре	Typeset	Type	Typeset
\hbar	ħ	\ell	ℓ
\imath	\imath	\jmath	J
\wp	ço	\partial	∂
\Im	3:	\Re	ℛ
\infty	∞	\prime	,
\emptyset	Ø	\varnothing	Ø
\forall	\forall	\exists	∃
\smallint	ſ	\triangle	\triangle
\top	Т	\bot	\perp
\P	¶	\S	§
\dag	†	\ddag	‡
\flat	Ь	\natural	Ц
\sharp	#	\angle	_
\clubsuit	*	\diamondsuit	\Diamond
\heartsuit	\Diamond	\spadesuit	٠
\surd		\nabla	∇
\pounds	£	\neg or \lnot	\neg
\Box		\Diamond	\Diamond
\mho	Ω		
\hslash	\hbar	\complement	C
\backprime	\	\nexists	∌
\Bbbk	k		
\diagup	/	\diagdown	
\blacktriangle	A	\blacktriangledown	▼
\triangledown	∇	\eth	ð
\square		\blacksquare	
\lozenge	\Diamond	\blacklozenge	*
\measuredangle	4	\sphericalangle	⋖
\circledS	(S)	\bigstar	*
\Finv	Ь	\Game	G

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B.6 Delimiters

Name	Type	Typeset
left parenthesis	((
right parenthesis))
left bracket	[or \lbrack	[
right bracket] or \rbrack]
left brace	$\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	{
right brace	<pre>\} or \rbrace</pre>	}
backslash	\backslash	\
forward slash	/	/
left angle bracket	\langle	<
right angle bracket	\rangle	>
vertical line	or \vert	
double vertical line	\ or \Vert	
left floor	\lfloor	Ĺ
right floor	\rfloor	
left ceiling	\lceil	
right ceiling	\rceil	1
upward	\uparrow	1
double upward	\Uparrow	1
downward	\downarrow	1
double downward	\Downarrow	#
up-and-down	\updownarrow	1
double up-and-down	\Updownarrow	1
upper-left corner	\ulcorner	Г
upper-right corner	\urcorner	7
lower-left corner	\llcorner	L
lower-right corner	\lrcorner	_

B.7 Operators

"Pure" operators, with no limits

Type	Typeset	Type	Typeset	Type	Typeset	Type	Typeset
\arccos	arccos	\cot	cot	\hom	hom	\sin	\sin
\arcsin	arcsin	\coth	\coth	\ker	ker	\sinh	\sinh
\arctan	arctan	\csc	CSC	\1g	lg	\tan	tan
\arg	arg	\deg	\deg	\ln	\ln	\tanh	tanh
\cos	COS	\dim	\dim	\log	\log		
\cosh	\cosh	\exp	\exp	\sec	sec		

Operators with limits

Type	Typeset	Type	Typeset
\det	det	\limsup	\limsup
\gcd	gcd	\max	max
\inf	inf	\min	\min
\lim	\lim	\Pr	$_{\mathrm{Pr}}$
\liminf	lim inf	\sup	\sup
\injlim	inj lim	\projlim	$\operatorname{proj}\lim$
\varliminf	$\underline{\lim}$	\varlimsup	$\overline{\lim}$
$\operatorname{\var}$	$\xrightarrow{\lim}$	$\vert varprojlim$	lim

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B.7.1 Large operators

Type	Inline	Displayed
\int_{a}^{b}	\int_a^b	\int_a^b
\int_{a}^{b}	\oint_a^b	\oint_a^b
$\int_{a}^{a}^{b}$	\iint_a^b	\iint_a^b
$\left(\frac{a}^{b} \right)$	\iiint_a^b	\iiint_a^b
$\left(\frac{a}^{b}\right)$	\iiint_a^b	\iiint_a^b
$\left(\frac{a}^{b}\right)$	$\int \cdots \int_a^b$	$\int \cdots \int_a^b$
\prod_{i=1}^{n}	$\prod_{i=1}^n$	$\prod_{i=1}^{n}$
$\coprod_{i=1}^{n}$	$\coprod_{i=1}^{n}$	$\coprod_{i=1}^{n}$
$\sigma_{i=1}^{n}$	$\bigcap_{i=1}^n$	$\bigcap_{i=1}^{n}$
$\big(\sum_{i=1}^{n} $	$\bigcup_{i=1}^{n}$	$\bigcup_{i=1}^{n}$
\bigwedge_{i=1}^{n}	$\bigwedge_{i=1}^n$	$\bigwedge_{i=1}^{n}$
$\big(i=1 ^{n} $	$\bigvee_{i=1}^{n}$	$\bigvee_{i=1}^{n}$
\bigsqcup_{i=1}^{n}	$\bigsqcup_{i=1}^{n}$	$\prod_{i=1}^{n}$
\biguplus_{i=1}^{n}	$\biguplus_{i=1}^n$	$\bigcup_{i=1}^{n}$
$\big(i=1 ^{n} $	$\bigotimes_{i=1}^n$	$\bigotimes_{i=1}^{n}$
\bigoplus_{i=1}^{n}	$\bigoplus_{i=1}^n$	$\bigoplus_{i=1}^{i=1}$
\bigodot_{i=1}^{n}	$\bigcirc_{i=1}^n$	$\bigcup_{i=1}^{n}$
$\sum_{i=1}^{n}$	$\sum_{i=1}^{n}$	$\sum_{i=1}^{n}$

B.8 Math accents and fonts

Math accents

		amsxtra	
Туре	Typeset	Type	Typeset
\acute{a}	á		
\bar{a}	\bar{a}		
\breve{a}	$reve{a}$	\spbreve	U
\check{a}	ă	\spcheck	V
\dot{a}	\dot{a}	\spdot	
\ddot{a}	\ddot{a}	\spddot	
\dddot{a}	\ddot{a}	\spdddot	
\ddddot{a}	\ddot{a}		
\grave{a}	à		
\hat{a}	\hat{a}		
\widehat{a}	\widehat{a}	\sphat	^
\mathring{a}	\mathring{a}		
\tilde{a}	\tilde{a}		
<page-header></page-header>	\widetilde{a}	\sptilde	~
\vec{a}	\vec{a}		

Math fonts

Туре	Typeset
I₄TEX	
\mathbf{A}	\mathbf{A}
\mathcal{A}	\mathcal{A}
\mathit{A}	A
\mathnormal{A}	A
\mathrm{A}	A
A	Α
\mathtt{A}	A
\boldsymbol{\alpha}	α
\mathbb{A}	A
\mathfrak{A}	21
\mathscr{a}	\mathcal{A}

\mathscr requires the eucal package with the mathscr option

B.9 Math spacing commands

Name	Width	Short	Long
1 mu (math unit)	1	\mspace{1mu}	
thinspace	U	١,	\thinspace
medspace	U	\:	\medspace
thickspace	и	\;	\thickspace
interword space	ш	_	
1 em	\Box		
2 em			\qquad
Negative space			
1 mu	1		\mspace{-1mu}
thinspace	U	\!	\negthinspace
medspace	U		\negmedspace
thickspace	ш		\negthickspace

APPENDIX

Text symbol tables

C.1 Some European characters

Name	Type	Typeset	Type	Typeset
a-ring	\aa	å	\AA	Å
aesc	\ae	æ	\AE	Æ
ethel	\oe	œ	\0E	Œ
eszett	\ss	ß	\SS	SS
inverted question mark	?'	i		
inverted exclamation mark	! "	i		
slashed L	\1	ł	\L	Ł
slashed O	\0	ø	\0	Ø

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C.2 Text accents

Name	Type	Typeset	Name	Type	Typeset
acute	\'{o}	ó	macron	\={o}	ō
breve	\u{o}	ŏ	overdot	\.{g}	ģ
caron/haček	\v{o}	ŏ	ring	\r{u}	ů
cedilla	\c{c}	ç	tie	\t{oo}	oo
circumflex	\^{o}	ô	tilde	\~{n}	$\tilde{\mathbf{n}}$
dieresis/umlaut	\"{u}	ü	underdot	\d{m}	$\dot{\mathrm{m}}$
double acute	\H{o}	ő	underbar	\b{o}	ō
grave	\'{o}	ò			
dotless i	\i	1	dotless j	\ j	J
	\'{\i}	í		\v{\j}	Ĭ

C.3 Text font commands

C.3.1 Text font family commands

Command with Argument	Command Declaration	Switches to the font family
	{\normalfont}	document
	{\em}	emphasis
	{\rmfamily}	roman
	{\sffamily}	sans serif
	{\ttfamily}	typewriter style
	{\upshape}	upright shape
	{\itshape}	italic shape
	{\slshape}	slanted shape
	{\scshape}	SMALL CAPITALS
	{\bfseries}	bold
	{\mdseries}	normal weight and width

C.3.2 Text font size changes

Command	ĿTEX sample text	AMS sample text
\Tiny	[not available]	sample text
\tiny	sample text	sample text
\SMALL or \scriptsize	sample text	sample text
\Small or \footnotesize	sample text	sample text
\small	sample text	sample text
\normalsize	sample text	sample text
\large	sample text	sample text
\Large	sample text	sample text
\LARGE	sample text	sample text
\huge	sample text	sample text
\Huge	sample text	sample text

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C.4 Additional text symbols

Name	Type	Typeset
ampersand	\&	&
asterisk bullet	\textasteriskcentered	*
backslash	\textbackslash	\
bar (caesura)	\textbar	
brace left	\{	{
brace right	\}	}
bullet	\textbullet	•
circled a	\textcircled{a}	(a)
circumflex	\textasciicircum	^
copyright	\copyright	©
dagger	\dag	†
double dagger (diesis)	\ddag	‡
dollar	\\$	\$
double quotation left	\textquotedblleft or ''	44
double quotation right	\textquotedblright or ''	27
em dash	\textemdash or	_
en dash	\textendash or	-
exclamation down	\textexclamdown or ! '	i
greater than	\textgreater	>
less than	\textless	<
lowline	_	-
midpoint	\textperiodcentered	
octothorp	\#	#
percent	\%	%
pilcrow (paragraph)	\P	¶
question down	\textquestiondown or ?'	i
registered trademark	\textregistered	R
section	\S	8

Additional text symbols, continued

Name	Туре	Typeset
single quote left	\textquoteleft or '	
single quote right	\textquoteright or '	,
sterling	\pounds	£
superscript	a	a
tilde	\textasciitilde	~
trademark	\texttrademark	$_{\mathrm{TM}}$
visible space	\textvisiblespace	u u

For the \textsubscript command, see Section 12.3.

C.5 Additional text symbols with T1 encoding

An accent

Name	Type	Typeset
Ogonek	\k{e}	ę

European characters

Name	Type	Typeset	Type	Typeset
Eth	\dh	ð	\DH	Ð
Dyet	\dj	đ	\DJ	Ð
Eng	\ng	ŋ	\NG	13
Thorn	\th	þ	\TH	Þ

Quotation marks

Name	Type	Typeset	Type	Typeset
Single Guillemet	\guilsinglleft	<	\guilsinglright	>
Double Guillemet	\guillemotleft	*	\guillemotright	»
Single Quotation	\quotesinglbase	,	\textquoteright	,
Double Quotation	\quotedblbase	**	\textquotedbl	"

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C.6 Text spacing commands

Name	Width	Short command	Long command
Positive Space			
Normal	varies	ш	
Intersentence	varies	\@.⊔	
Interword	varies	_	
Italic Corr.	varies	\/⊔	
Tie	varies	~	
Thinspace	U	١,	\thinspace
Medspace	U	\:	\medspace
Thickspace	U	\;	\thickspace
1 em	\Box		
2 em	\Box		\qquad
Negative Space			
Thinspace	И	\!	\negthinspace
Medspace	Ш		\negmedspace
Thickspace	U		\negthickspace