

B.1 Hebrew and Greek letters

Hebrew letters

Туре	Typeset
\aleph	×
\beth	コ
\daleth	٦
\gimel	ב

Greek letters

Lowercase

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

Uppercase

Туре	Typeset	Type	Typeset	Туре	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	\varOmega	Ω
\varLambda	Λ	\varUpsilon	Υ		

B.2 Binary relations

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

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

f \c x \to x^2

More binary relations

Туре	Typeset	Type	Typeset
\leqq	\leq	\geqq	\geq
\leqslant	\leq	\geqslant	≽
\eqslantless	<	\eqslantgtr	≽
\lesssim	\lesssim	\gtrsim	<i>M</i> ∧ ∧
\lessapprox	≨	\gtrapprox	≳
\approxeq	\approxeq		
\lessdot	⋖	\gtrdot	>
\111	***	/ggg	>>>
\lessgtr	\leq	\gtrless	\geq
\lesseqgtr	<u> </u>	\gtreqless	\geq
\lesseqqgtr	! ! ::	\gtreqqless	<i>></i>
\doteqdot	≑	\eqcirc	
\circeq	<u>•</u>	\triangleq	\triangleq
\risingdotseq	=	\fallingdotseq	≒.
\backsim	\sim	\thicksim	~
\backsimeq	\leq	\thickapprox	≈
\preccurlyeq	\preccurlyeq	\succcurlyeq	≽
\curlyeqprec	\curlyeqprec	\curlyeqsucc	\succcurlyeq
\precsim	$\stackrel{\sim}{\sim}$	\succsim	\succeq
\precapprox	\approx	\succapprox	\\ \\ \\ \\
\subseteqq	\subseteq	\supseteqq	\supseteq
\Subset	€	\Supset	∋
\vartriangleleft	\triangleleft	\vartriangleright	\triangleright
\trianglelefteq	\leq	\trianglerighteq	\trianglerighteq
\vDash	F	\Vdash	I
\Vvdash	III		
\smallsmile	\smile	\smallfrown	$\overline{}$
\shortmid	1	\shortparallel	П
\bumpeq	<u></u>	\Bumpeq	≎
\between	Ŏ	\pitchfork	ф
\varpropto	\propto	\backepsilon	Э
\blacktriangleleft	◄	\blacktriangleright	•
\therefore	$\ddot{\cdot}$.	\because	::

Negated binary relations

Туре	Typeset	Type	Typeset
\neq or \ne	\neq	\notin	∉
\nless	≮	\ngtr	*
\nleq	≰	\ngeq	≱
\nleqslant	≰	\ngeqslant	≱
\nleqq	≨	\ngeqq	≱
\lneq	\leq	\gneq	≥
\lneqq	≨	\gneqq	\geq
\lvertneqq	\leqq	\gvertneqq	\geqq
\lnsim	\lesssim	\gnsim	\gtrsim
\lnapprox	≨	\gnapprox	⋧
\nprec	\star	\nsucc	\neq
\npreceq	$\not\preceq$	\nsucceq	$\not\succeq$
\precneqq	$\not \equiv$	\succneqq	≽
\precnsim	$\not \supset$	\succnsim	\succsim
\precnapprox	≨	\succnapprox	≿ ≋
\nsim	≁	\ncong	≇
\nshortmid	ł	\nshortparallel	Ħ
\nmid	†	\nparallel	#
\nvdash	¥	\nvDash	⊭
\nVdash	\mathbb{H}	\nVDash	¥
\ntriangleleft		\ntriangleright	$\not\triangleright$
\ntrianglelefteq	⊉	\ntrianglerighteq	⊭
\nsubseteq	⊈	\nsupseteq	⊉
\nsubseteqq	≨	\nsupseteqq	⊉
\subsetneq	\subsetneq	\supsetneq	\supseteq
\varsubsetneq	≨	\varsupsetneq	⊋
\subsetneqq	\subseteq	\supsetneqq	\supseteq
\varsubsetneqq	≨	\varsupsetneqq	\supseteq

B.3 Binary operations

Туре	Typeset	Туре	Typeset
+	+	_	
\pm	\pm	\mp	Ŧ
\times	×	\cdot	
\circ	0	\bigcirc	\bigcirc
\div	÷	\bmod	mod
\cap	\cap	\cup	\cup
\sqcap	П	\sqcup	
\wedge or \land	\wedge	\vee or \lor	\vee
\triangleleft	◁	\triangleright	\triangleright
\bigtriangleup	\triangle	\bigtriangledown	∇
\oplus	\oplus	\ominus	\ominus
\otimes	\otimes	\oslash	\oslash
\odot	\odot	\bullet	•
\dagger	†	\ddagger	‡
\setminus	\	\smallsetminus	\
\wr	}	\amalg	П
\ast	*	\star	*
\diamond	\Diamond		
\lhd	\triangleleft	\rhd	\triangleright
\unlhd	⊴ ÷	\unrhd	\trianglerighteq
\dotplus	÷	\centerdot	•
\ltimes	×	\rtimes	\rtimes
\leftthreetimes	\rightarrow	\rightthreetimes	/
\circleddash	\ominus	\uplus	\boxplus
\barwedge	$\overline{\wedge}$	\doublebarwedge	$\overline{\overline{\wedge}}$
\curlywedge	人	\curlyvee	Υ
\veebar	$\underline{\vee}$	\intercal	Т
\doublecap or \Cap	$\qquad \qquad \square$	\doublecup or \Cup	U
\circledast	*	\circledcirc	0
\boxminus		\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	\iff	\Longrightarrow	\Longrightarrow
\leftrightarrow	\longleftrightarrow	\longleftrightarrow	\longleftrightarrow
\Leftrightarrow	\Leftrightarrow	\Longleftrightarrow	\iff
\uparrow	↑	\downarrow	\downarrow
\Uparrow	\uparrow	\Downarrow	\Downarrow
\updownarrow	\uparrow	\Updownarrow	\$
\nearrow	7	\searrow	`
\swarrow	/	\nwarrow	_
\iff	\iff	\mapstochar	ŀ
\mapsto	\mapsto	\longmapsto	\longmapsto
\hookleftarrow	\leftarrow	\hookrightarrow	\hookrightarrow
\leftharpoonup		\rightharpoonup	
\leftharpoondown	$\overline{}$	\rightharpoondown	\rightarrow
\leadsto	\sim		
\leftleftarrows	otin	\rightrightarrows	\Rightarrow
\leftrightarrows	$\stackrel{\longleftarrow}{\Longrightarrow}$	\rightleftarrows	\rightleftharpoons
\Lleftarrow	€	\Rrightarrow	\Rightarrow
\twoheadleftarrow	~~	\twoheadrightarrow	\longrightarrow
\leftarrowtail	\leftarrow	\rightarrowtail	\rightarrowtail
\looparrowleft	\leftarrow P	\looparrowright	\hookrightarrow
\upuparrows	$\uparrow\uparrow$	\downdownarrows	$\downarrow \downarrow$
\upharpoonleft	1	\upharpoonright	1
\downharpoonleft	1	\downharpoonright	ļ
\leftrightsquigarrow	~~~	\rightsquigarrow	~→
\multimap	-0		
\nleftarrow	↔	\nrightarrow	\rightarrow
\nLeftarrow	#	\nRightarrow	#
\nleftrightarrow	$\leftrightarrow \rightarrow$	\nLeftrightarrow	#
\dashleftarrow	←	\dashrightarrow	>
\curvearrowleft	$ \leftarrow $	\curvearrowright	\curvearrowright
\circlearrowleft	Q	\circlearrowright	\bigcirc
\leftrightharpoons	\leftrightharpoons	\rightleftharpoons	\rightleftharpoons
\Lsh	\uparrow	\Rsh	ightharpoons

B.5 Miscellaneous symbols

Туре	Typeset	Type	Typeset
\hbar	\hbar	\ell	ℓ
\imath	\imath	\jmath	Ĵ
\wp	\wp	\partial	∂
\Im	3.	\Re	\Re
\infty	∞	\prime	1
\emptyset	Ø	\varnothing	Ø
\forall	\forall	\exists	∃
\smallint	\int	\triangle	\triangle
\top	Т	\bot	\perp
\ P	\P	\S	§
\dag	†	\ddag	\$ ‡ 4
\flat	þ	\natural	Ц
\sharp	#	\angle	_
\clubsuit	.	\diamondsuit	\Diamond
\heartsuit	\Diamond	\spadesuit	^
\surd	$\sqrt{}$	\nabla	∇
\pounds	£	\neg or \lnot	\neg
\Box		\Diamond	\Diamond
\mho	Ω		
\hslash	\hbar	\complement	C
\backprime	1	\nexists	∄
\Bbbk	k		
\diagup		\diagdown	
\blacktriangle	A	\blacktriangledown	▼
\triangledown	∇	\eth	ð
\square		\blacksquare	
\lozenge	\Diamond	\blacklozenge	♦
\measuredangle	4	\sphericalangle	∢
\circledS	\odot	\bigstar	*
\Finv	Ь	\Game	G

B.6 Delimiters 503

B.6 Delimiters

Name	Type	Typeset
left parenthesis	((
right parenthesis))
left bracket	[or \lbrack	[
right bracket] or \rbrack]
left brace	\{ or \lbrace	{
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	
right floor	\rfloor	
left ceiling	\lceil	Γ
right ceiling	\rceil]
upward	\uparrow	↑
double upward	\Uparrow	\uparrow
downward	\downarrow	\downarrow
double downward	\Downarrow	\Downarrow
up-and-down	\updownarrow	\uparrow
double up-and-down	\Updownarrow	\updownarrow
upper-left corner	\ulcorner	Γ
upper-right corner	\urcorner	٦
lower-left corner	\llcorner	L
lower-right corner	\lrcorner	

B.7 Operators

"Pure" operators, with no limits

Туре	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	\lg	lg	\tan	tan
\arg	arg	\deg	\deg	\ln	\ln	\tanh	anh
\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	\Pr
\liminf	$\lim\inf$	\sup	\sup
\injlim	inj lim	\projlim	$\operatorname{proj}\lim$
\varliminf	$\underline{\lim}$	\varlimsup	$\overline{\lim}$
\varinjlim	$\stackrel{\lim}{\longrightarrow}$	\varprojlim	lim ←

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B.7.1 Large operators

Туре	Inline	Displayed
\int_{a}^{b}	\int_a^b	\int_a^b
\oint_{a}^{b}	\oint_a^b	\oint_a^b
\oint_{a}^{b}	\iint_a^b	\iint_a^b
\oint_{a}^{b}	\iiint_a^b	\iiint_a^b
\oint_{a}^{b}	\iiint_a^b	\iiint_a^b
\oint_{a}^{b}	$\int \cdots \int_a^b$	$\int \cdots \int_a^b$
\prod_{i=1}^{n}	$\prod_{i=1}^{n}$	$\prod_{i=1}^{n}$
\coprod_{i=1}^{n}	$\coprod_{i=1}^{n}$	$\coprod_{i=1}^{n}$
\bigcap_{i=1}^{n}	$\bigcap_{i=1}^n$	$\bigcap_{i=1}^{n}$
\bigcup_{i=1}^{n}	$\bigcup_{i=1}^{n}$	$\bigcup_{i=1}^{n}$
\bigwedge_{i=1}^{n}	$\bigwedge_{i=1}^n$	$\bigwedge_{i=1}^{n}$
\bigvee_{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}	$\biguplus_{i=1}^n$	$\biguplus_{i=1}^{n}$
\bigotimes_{i=1}^{n}	$\bigotimes_{i=1}^n$	$\bigotimes_{i=1}^{n}$
\bigoplus_{i=1}^{n}	$\bigoplus_{i=1}^n$	$\bigoplus_{i=1}^{r-1}$
\bigodot_{i=1}^{n}	$igodot_{i=1}^n$	$\bigcup_{i=1}^{r-1}$
\sum_{i=1}^{n}	$\sum_{i=1}^{n}$	$\sum_{i=1}^{n-1}$

B.8 Math accents and fonts

Math accents

		amsxtra	
Туре	Typeset	Туре	Typeset
\acute{a}	á		
\bar{a}	\bar{a}		
\breve{a}	$reve{a}$	\spbreve	J
\check{a}	\check{a}	\spcheck	V
\dot{a}	\dot{a}	\spdot	•
\ddot{a}	\ddot{a}	\spddot	
\dddot{a}	\ddot{a}	\spdddot	•••
\ddddot{a}	\ddot{a}		
\grave{a}	\grave{a}		
\hat{a}	\hat{a}		
\widehat{a}	\widehat{a}	\sphat	^
\mathring{a}	\mathring{a}		
\tilde{a}	\tilde{a}		
\widetilde{a}	\widetilde{a}	\sptilde	~
\vec{a}	\vec{a}		

Math fonts

Туре	Typeset
IATEX	
\mathbf{A}	\mathbf{A}
\mathcal{A}	$\mathcal A$
\mathit{A}	A
\mathnormal{A}	A
\mathrm{A}	A
A	Α
\mathtt{A}	Α
\boldsymbol{\alpha}	lpha
\mathbb{A}	\mathbb{A}
$Mathfrak\{A\}$	\mathfrak{A}
\mathscr{a}	$\mathcal A$

 $\verb|\mathscr|| requires the \verb|\engr|| eucal package with the \verb|\mathscr|| option$

B.9 Math spacing commands

Name	Width	Short	Long
1 mu (math unit)	ı	\mspace{1mu}	
thinspace	Ш		\thinspace
medspace	Ц	\:	\medspace
thickspace	Ш	\;	\thickspace
interword space	Ш	_	
1 em			
2 em			\qquad
Negative space			
1 mu	I		\mspace{-1mu}
thinspace	Ш	\ !	\negthinspace
medspace	Ш		\negmedspace
thickspace	П		\negthickspace



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	\OE	Œ
eszett	\ss	В	\SS	SS
inverted question mark	? `	٤		
inverted exclamation mark	i ,	i		
slashed L	\1	ł	\L	Ł
slashed O	\0	Ø	\0	Ø

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C.2 Text accents

Name	Туре	Typeset	Name	Type	Typeset
acute	\'{0}	ó	macron	\={o}	ō
breve	\u{o}	ŏ	overdot	\.{g}	ġ
caron/haček	\v{o}	ŏ	ring	\r{u}	ů
cedilla	\c{c}	Ç	tie	\t{oo}	oo
circumflex	\^{0}	ô	tilde	\~{n}	$\tilde{\mathrm{n}}$
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}	ď

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

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C.3.2 Text font size changes

Command	IATEX sample text AMS sample tex	
\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	Туре	Typeset
ampersand	\&	&
asterisk bullet	\textasteriskcentered	*
backslash	\textbackslash	\
bar (caesura)	\textbar	
brace left	\ {	{
brace right	\}	}
bullet	\textbullet	•
circled a	<pre>\textcircled{a}</pre>	(a)
circumflex	\textasciicircum	^
copyright	\copyright	©
dagger	\dag	†
double dagger (diesis)	\ddag	‡
dollar	\\$	\$
double quotation left	\textquotedblleft or ``	"
double quotation right	\textquotedblright or $^{\prime\prime}$	"
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	\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 '	4
single quote right	\textquoteright or $^{\prime}$,
sterling	\pounds	£
superscript	a	a
tilde	\textasciitilde	~
trademark	\texttrademark	TM
visible space	\textvisiblespace	u

For the \t extsubscript command, see Section 11.3.

C.5 Additional text symbols with T1 encoding

C.5.1 Accents

Name	Туре	Typeset
ogonek	\k{e}	ę

C.5.2 European characters

Name	Туре	Typeset	Type	Typeset
eth	\dh	ð	\DH	Ð
dyet	\dj	đ	\DJ	Ð
eng	\ng	ŋ	\NG	\mathcal{D}
thorn	\th	þ	\TH	Þ

C.5.3 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	u	
Intersentence	varies	\@	
Interword	varies	_	
Italic Corr.	varies	\/_	
Tie	varies	~	
Thinspace	U		\thinspace
Medspace	Ш	\:	\medspace
Thickspace	Ш	\;	\thickspace
1 em			
2 em			\qquad
Negative Space			
Thinspace	Ш	\!	\negthinspace
Medspace	Ш		\negmedspace
Thickspace	Ш		\negthickspace