# Symbols & Logical Syntax in $\LaTeX$

# Lewis Britton

### Greek & Hebrew Characters

### Alphabetical Letters

A, $\alpha$	\Alpha, \alpha	Ι, ι	\Iota, \iota	Ρ, ρ, ρ	\Rho, \rho, \varrho
B, $\beta$	\Beta, \beta	$K, \kappa, \varkappa$	\Kappa, \kappa, \varkappa	$\Sigma$ , $\sigma$ , $\varsigma$	\Sigma, \sigma, \varsigma
$\Gamma, \gamma$	\Gamma, \gamma	$\Lambda,~\lambda$	\Lambda, \lambda	$T, \tau$	\Tau, \tau
$\Delta, \ \delta$	\Delta, \delta	$M, \mu$	\Mu, \mu	$\Upsilon$ , $\upsilon$	\Upsilon, \upsilon
E, $\epsilon$ , $\varepsilon$	\Epsilon, \epsilon, \varepsilon	N, $\nu$	\Nu, \nu	$\Phi, \phi, \varphi$	\Phi, \phi, \varphi
$Z, \zeta$	\Zeta, \zeta	$\Xi, \xi$	\Xi, \xi	Χ, χ,	\Chi, \chi
H, $\eta$	\Eta, \eta	О, о	\Omicron, \omicron	$\Psi, \psi$	\Psi, \psi
$\Theta$ , $\theta$ , $\vartheta$	\Theta, \theta, \vartheta	$\Pi, \pi, \varpi$	\Pi, \pi, \varpi	$\Omega, \omega$	\Omega, \omega

#### Miscellaneous Characters & Punctuation

F	\digamma	C	\complement	_	\angle	3	\Im	G	\Game
×	\aleph	$\ell$	\ell	4	\measuredangle	R	∖Re	E	\Finv
コ	\beth	ð	\eth	∢	\sphericalangle	ប	\mho	$\partial$	\partial
٦	\daleth	$\hbar$	\hbar	$\sqrt{}$	\surd	80	\wp	<sup>TM</sup> , ©	\trademark, \copyright
ב	\gimel	ħ	\hslash	Ц	\natural	k	\Bbbk	£, \$	\pounds, \\$
$\imath$	\imath	Т	\top	#	\sharp	Ø	\emptyset	$\Diamond$ , $\Diamond$	\diamondsuit, \lozenge
J	\jmath	1	\bot	b	\flat	$\infty$	$\$	$\Diamond$	\heartsuit
$\nabla$	\nabla	§	\S	Δ	\vartriangle	□, □	\Box, \square	*	\clubsuit
$\triangle$	\triangle	Ø	\varnothing	▽	\triangledown	<b>♦</b>	\Diamond	<b>^</b>	\spadesuit
<b>A</b>	\blacktriangle		\blacksquare		\diagdown	∃	\exists	*	\bigstar
•	\blacktriangledown	•	\blacklozenge	/	\diagup	∄	\nexists		

### Text Mode Miscellaneous Characters & Punctuation

ó	\'{o}	ō	\b{o}	ŏ	\v o	Ø, ø	\0, \0	<b>¶</b>	\P	£, \$	$, \$
ò	\'{o}	ò	\.{o}	ó	\d o	Å, å	$\AA, \a$	§	\S	!, ?	!,?
ö	\"{o}	ó	\d{o}	ô	\r o	Æ,æ	$\AE, \ae$	†	\dag	., ,	., ,
ô	\^{o}	Q	\c{o}	ő	\H o	ß	\ss	‡	\ddag	٠, ٠	·, ,
õ	\~{o}	ŏ	\u{o}	o	\t o	1	\i	<sup>TM</sup> , ©	\trademark, \copyright	", "	", ,, or "
ō	\={o}	ő	\H{o}	oo	\t{oo}	1	\i	(R), (R)	\textregistered, \circledR	:, ;	:,;

# Basic Math Mode

# Alphabets

$XYX \ xyz$	XYZ\ xyz	XYZ xyz	$\mathbf{XYZ} \mathbf{xyz}$	XYZ	$\mathbb{XYZ}$
XYZ xyz	\mathnormal{XYZ\ xyz}	XYZ xyz	$XYZ\ xyz$	xyz	$\mathbf{XYZ}$
$XYZ \ xyz$	\mathit{XYZ\ xyz}	XYZ xyz	$XYZ\ xyz$	XY3	$\mathbf{XYZ}$
XYZ xyz	\mathrm{XYZ\ xyz}				

### Spacing

		D. C	1.1	. \   1 \ \ \ [ 2 - 2 - \   1 \ \ 1	N 9 (41.1)
xyz	xyz	Default math	abad	a\!b\mspace{-3mu}c\negthinspace d	Neg. 3mu 'thin'
x y z	x\ y\ z	Expanded	dad	a\negmedspace b\mspace{-4mu}c\negmedspace d	Neg. 4mu 'medium'
$\sin x \cos y$	\sin x\cos y	Operator	dad	$\verb a negthickspace  b mspace{-5mu}c negthickspace d $	Neg. 5mu 'thick'
$a\ b\ c\ d$	ab\mspace{3mu}c\thinspace d	3mu 'thin'	a $b$	ab	Width of 'xxx'
$a\ b\ c\ d$	$a\:b\mspace{4mu}c\mspace d$	4mu 'medium'			
$a\ b\ c\ d$	a\;b\mspace{5mu}c\thickspace d	5mu 'thick'			

# Math Accents & Constructs

Note that most basic accents can be stacked. For example,  $\accepte{acute\{x\}}\$  yields  $\acute{x}$ . Or,  $\accepte{acute\{x\}}\$  yields  $\acute{x}$ .

$\acute{x}$	$\acute{x}$	$\dot{x}$	\dot{x}	$\overline{xyz}$	\overline{xyz}	$\stackrel{xyz}{\leftarrow}$	\xleftarrow[abc]{xyz}	$\sum_{K}$	$\operatorname{Voverset}\{K\}_{\sum}$
ù	$\grave{x}$	$\ddot{x}$	\ddot{x}	xyz	\underline{xyz}	$\xrightarrow{xyz}$	\xrightarrow[abc]{xyz}	$\sum_{k=1}$	lem:lem:lem:lem:lem:lem:lem:lem:lem:lem:
						<u>~</u>		n=1	
$\bar{x}$	\bar{x}	ž	$\check{x}$	$\overrightarrow{xyz}$	\overrightarrow{xyz}	xyz	\overbrace{xyz}	$\sqrt{x}$	\sqrt{x}
$\hat{x}$	$\hat{x}$	$\vec{x}$	$\vec{x}$	xyz	\overleftarrow{xyz}	xyz	\underbrace{xyz}	$\sqrt[n]{x}$	$\sqrt[n]{x}$
$\tilde{x}$	$\tilde{x}$	$\widehat{xyz}$	\widehat{xyz}	$\overrightarrow{xyz}$	\overleftrightarrow{xyz}	f, f', f'	f, f', f\prime		
$reve{x}$	\breve{x}	$\widetilde{xyz}$	\widetilde{xyz}	$\frac{abc}{xyz}$	\frac{abc}{xyz}	$y \sum_{k}^{j}$	$\label{final} $$ \left( y^x \right)_{k^j} \sum_{k^j} \sum_{k^j} \sum_{k^j} \sum_{k^j} \left( y^k \right)_{k^j} $		

# **Binary Relations**

Note that you can produce according negations by either adding the \not command as a prefix or ordinarily by preceding the commands with 'n'. For example, \not= or \neq turns = to  $\neq$ .

#### Standard Relations

<	<	>	>	=	=	€	\in	∋	\ni or \owns
$\leq$	$\leq or \leq o$	$\geq$	\geq or \ge	=	\equiv	-	\vdash	-	\dashv
«	\11	>>	\gg	Ė	\doteq		\mid		\parallel
$\prec$	\prec	>	\succ	~	\sim	_	\smile		\frown
$\preceq$	\preceq	≽	\succeq	~	\simeq	3	\exists	_	\lnot or \neg
$\subset$	\subset	$\supset$	\supset	≈	\approx	=	\models	上	\perp
$\subseteq$	\subseteq	⊇	\supseteq	$\simeq$	\cong	$\times$	\asymp	$\propto$	\propto
	\sqsubset		\sqsupset	M	Join	<b>≠</b>	\neq	$\forall$	\forall
	\sasubsetea		\sasupsetea	M	\bowtie	∉	\notin	7. \	\prime. \backprime

#### Additional Relations

<	\lessdot	≽	\gtrdot	$ \subseteq$	\subseteqq	⊇	\supseteqq	~	\thicksim
€	\leqslant	≥	\geqslant	_	\Subset	∍	\Supset	≈	\thickapprox
<	\eqslantless	≽	\eqslantgtr		\sqsubset		\sqsupset	≊	\approxeq
$\leq$	\leqq	$\geq$	\geqq	<u> </u> ::	\therefore	·.·	\because	~	\backsim
_ <<<	\lll or \llless	- >>>	\gggtr	1	\shotmid	П	\shortparallel		\backsimeq
≨	\lessapprox	≳	\gtrapprox		\smallsmile	_	\smallfrown	þ	\vDash
$\widetilde{\leqslant}$	\lessgtr	$\stackrel{\sim}{\geqslant}$	\gtrless	◁	\vartriangleleft	$\triangleright$	\vartriangleright		vdash
	\lesseqgtr	È	\gtreqless	⊴	\trianglelefteq	⊵	\trianglerighteq	II⊢	Vvdash
VIIV	\lesseqqgtr	VIIVVIIV	\gtreqqless	◀	\blacktriangleleft	<b>•</b>	\blacktriangleright	Э	\backepsilon
$\stackrel{\frown}{\preccurlyeq}$	\precurlyeq	>	\succcurlyeq	÷	\doteqdot or \Doteq		\eqcirc	α	\varpropto
$\Rightarrow$	\curlyeqprec	⋟	\curlyeqsucc	≓	\risingdotseq	≒.	\fallingdotseq	Ŏ	\between
≾	\precsim	≿	\succsim	<u></u>	\circeq	≜	\tirangleeq	ф	\pitchfork
Α.	\precapprox		\succepprox		\bimpea	-≎-	\Bumpea		

### **Binary Operators**

#### Standard Operators

+	+	_	-	\ \	\lor or \vee		\land or \wedge	⊲	\1hd	$\triangleright$	\rhd
$\pm$	\pm	Ŧ	\mp	0	\oplus	$\Theta$	\ominus	⊴	$\unline$	⊵	\unrhd
×	\times		\cdot	0	\odot	0	\oslash	•	\bullet	0	\circ
÷	\div	\	\setminus	8	\otimes	0	\bigcirc	*	\ast	*	\star
$\cup$	\cup	$\cap$	\cap	Δ	\bigtriangleup	$\nabla$	\bigtriangledown	<b>♦</b>	$\diamond$		\wr
Ш	\sqcup	П	\sqcap	◁	\triangleleft	⊳	\triangleright	П	\amalg	₩	\uplus

# Additional Operators

÷	\dotplus		\centerdot	⊞	\boxplus		\boxminus	*	\divideontimes
$\bowtie$	\ltimes	×	\rtimes	$\boxtimes$	\boxtimes		\boxdot	*	\circledast
U	\Cup or \doublecup	M	\Cap or \doublecap	$\rightarrow$	\leftthreetimes	_ <	\rightthreetimes	0	\circledcirc
$\underline{\vee}$	\veebar	_	\barwedge	Υ	\curlyvee	人	\curlywedge	Θ	\circleddash
_	\doublebarwedge	Т	\intercal	\	\setminus	\	\smallsetminus		

# Large Operators

$\sum$	\sum	<b>   </b>	\int	ſſſ	$\ilde{\label{limit}}$	$\cap$	\bigcap	$\oplus$	\bigoplus	V	bigvee
Π	\prod	∮	\oint	ſſſſ	$\ilde{\text{liiint}}$	U	\bigcup	$\otimes$	\bigotimes	$\wedge$	\bigwedge
П	\coprod	l ff	\iint			[+J	\bigoplus	$\odot$	\bigodot		\bigsqcup

# Functions

arccos	\arcoss	csc	\csc	inj lim	\injlim	max	\max	tan	\tan
arcsin	\arcsin	deg	\deg	ker	\ker	min	\min	tanh	\tanh
arctan	\arctan	det	\det	lg	\lg	$\Pr$	\Pr	$\varinjlim$	\varinjlim
arg	\arg	dim	\dim	lim	\lim	proj lim	\projlim	ļim	\varprojlim
cos	\cos	exp	\exp	lim inf	\liminf	sec	\sec	lim	\varliminf
cosh	\cosh	$\operatorname{gcd}$	\gcd	lim sup	\limsup	sin	\sin	$\overline{\lim}$	\varlimsup
cot	\cot	hom	\hom	ln	\ln	sinh	\sinh	$226_0^1$	\operatorname{226}_0^1
1.	A	c	١	1	\ <b>7</b>				

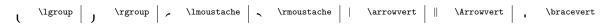
# Delimiters

Note that you can produce according relatively sized symbols by preceding the commands with  $\left(\frac{abc}{xyz}\right)$ . For example,  $\left(\frac{abc}{xyz}\right)$  turns  $\left(\frac{abc}{xyz}\right)$  to  $\left(\frac{abc}{xyz}\right)$ . Sometimes commands can be preceded with '1' or 'r' e.g.,  $\left(\frac{abc}{xyz}\right)$ . Thus, giving the  $\left(\frac{abc}{xyz}\right)$  to of paired symbols.

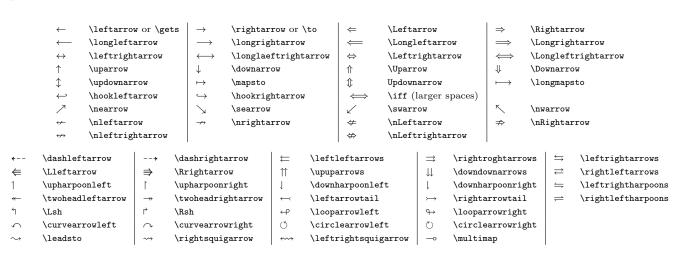
### Standard Delimiters

(	(	[	\lbrack or [	(	$\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	L	\lfloor	Г	\ulcorner	1	\uparrow
)	)	]	\rbrack or ]	>	\rangle	[	\lceil	٦	\urcorner	↓	\downarrow
	\vert or	{	\lbrace or $\$	Γ	\lceil	/	/	L	\llcorner	1	\Uparrow
	\Vert or \	}	\rbrace or \}	L	\lfloor	\	\backslash	_	\rcorner	↓	\Downarrow

#### Large Delimiters



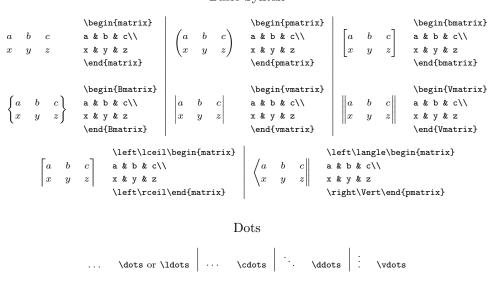
#### Arrows



### Matrices & Arrays

Note that any of the following can also be displayed inline as well as stand-alone. It's recommended that you use smallmatrix for this. Thus, you must preced and succeed \begin and \end smallmatrix with \left<delimiter> and \right<delimiter>, respectively. For example, \left(\begin{smallmatrix}a & b & c\x & y & z\end{smallmatrix}\right) yields  $\begin{pmatrix} a & b & c \\ x & y & z \end{pmatrix}$ .

### Basic Syntax



#### Array Environment

Note that arrays operate in the same manner as tables such that they permit column alignment 1, c and r etc., columns can be divided using pipes (|) new row lines with  $\setminus$ , and the use of  $\$  to name a few examples. Columns are separated the same as within tables; with (n-1) & ampersand symbols, for n columns. Some simple examples follow.

#### Relative Font Sizes

#### Math Mode

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad \text{displaystyle x=\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$$
 
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad \text{textstyle x=\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}} \qquad \text{scriptstyle x=\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$$
 
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad \text{scriptstyle x=\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}} \qquad \text{scriptscriptstyle x=\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$$

# Text Mode

tiny	\tiny{tiny}	normal	\normalsize{normal}	huge	\huge{huge}
script	\scriptsize{script}	large	\large{large}		
footnote	\footnotesize{footnote}	Large	\Large{Large}	Huge	\Huge{Huge}
small	\small{small}	LARGE	\LARGE{LARGE}		