FASTEX

version: October 1, 1994

Introduction

The purpose of this package is to speed up and make more accurate, the typing of mathematical manuscripts done in LaTeX (and other forms of TeX) on the Macintosh through a system of keyboard shortcuts. Our system allows the user to keep their hands on the standard part of the keyboard and to minimize the use of special keys, which can slow down typing considerably. Something else is important too: in the electronic communication of TeX source files between authors, it is helpful to use a system that produces, as much as possible, a default TeX source file, without too many abbreviations, (i.e. \define commands), which can make it hard or impossible for a coauthor to read the source file. FASTEX will help with all of these issues.

We have adopted the software application "TypeIt4Me", which enables your computer to recognize a keystroke sequence *without using command or function keys*[1]. For example, this sequence: "xa spacebar" activates "\alpha". The keystroke sequences do not interfere with normal English or most mathematical usage. In addition, our shortcut list can be easily edited, expanded or modified for your own custom needs. More advanced users can try one of the more complex shortcuts from the list below, such as "dcd1" for "double commutative diagram 1".

Acknowledgments

We thank all who directly and indirectly contributed to this project with valuable comments, advice, and more importantly, experience. This includes Anne Kao, Sue Knapp, Greg Kubota, June Meyermann, Andreas Plaß and Esther Zack.

[1] TypeIt4Me is a shareware product of Riccardo Ettore. Users should fill out the TypeIt4Me registration form and purchase it for US $30, as explained in the "about TypeIt4Me" item under the menu bar. The enclosed disk contains the current version, 4.3.1.

System Requirements

- A Macintosh using system 7
- A TEX application (such as Textures[2], Alpha, etc.)
- (Optional) The AMS fonts[3]

Installation Instructions

1. Copy the TypeIt4Me control panel into the control panels folder in your system folder.
2. Put the FASTEXshortcuts file on your desktop.
3. Put the FASTEXdocument file anywhere convenient.
4. Restart your machine.
5. Open your TEX application.
6. Go to the TypeIt4Me icon on the top left of your menu bar and open the FASTEXshortcuts file.
7. You are ready to start!

[2]Blue Sky Research, Portland, Oregon (800)622-8398, (503) 222-9571, help@bluesky.com
[3]American Mathematical Society, P.O Box 6248, Providence, RI 02940 (401)272-9500

Test FASTEX

Open a new file using your TEX application and type "xa" followed by a spacebar, comma, or a parenthesis. Then "\alpha" should automatically appear. (The letter "x" is the generic signal for a greek letter.) Now try some of the other keyboard shortcuts listed in the left hand columns on the pages that follow!

Some items such as "mtx3" for 3×3 matrices will help you remember complex TEX scripts; you just edit it to your own needs.

Turning TypeIt4Me On and Off

To temporarily **turn off** TypeIt4Me, type Option-Shift-O (that is an "oh" not a zero). Typing Option-Shift-O again will turn TypeIt4Me on again. We recommend keeping TypeIt4Me off when using the finder.

When TypeIt4Me is on, you can still stop an expansion by typing Shift-Spacebar (hold down the shift key while typing the spacebar) or by clicking the mouse before the spacebar. For example, to have an isolated "xa" literally appear, you type "xa" and then type Shift-Spacebar or click the mouse button and then the spacebar. Of course if "xa" appears as part of a word it will not get expanded!

Foreign Language FASTEX will not interfere with normal English usage. If you are temporarily typing in a foreign language you will probably want to be careful of unwanted expansions. For instance, in French the word "la" will expand to a subscript a. If you type extensively in a foreign language you may want to change some abbreviations.

Editing and Creating Your Own Abbreviations

To see how TypeIt4Me works, open the help file "about TypeIt4Me" under the TypeIt4Me menu. We have set some default hot keys for editing and creating shortcuts. You can change these settings using the TypeIt4Me hot key assignments under "preferences".

To EDIT an existing shortcut, type Option-Shift-E and a file of existing entries appears. You can edit them directly in this window.

To CREATE a new entry, type the text of what you want to abbreviate in your TEX application and copy it to the clipboard in the usual Macintosh way with Command-C. Then type Option-Shift-C and type the name of your abbreviation, and then click "OK".

BEFORE creating your own files or expanding or modifying the ones with this package, be sure to save and safely store a copy of the default file FASTEXshortcuts and give the file you create a different name.

Creating Your Own Address/Email List

TypeIt4Me is also convenient for creating an address/email/phone/fax/etc. list that can be used, for example, with your word processing and communications (email) applications. We have included the sample file called "TypeIt4Me addresses" which is opened the same way as you open the FASTEXshortcuts file. We have included the following samples: "adname", for mailing address, "emname" for email addresses, "phname" for phone numbers and "faxname" for fax numbers.

LaTeX and Other Forms of TeX

We have assumed LaTeX as our default format for TeX. Of course there are many other varieties such as AMS-TeX, AMS-LaTeX, REV-TeX, etc. and the present system may be readily edited to meet customized needs.

Blank Spaces

In math mode, the use of FASTEX will generally leave blank spaces in the TeX source file. However, these blank spaces do not affect the typeset output. There are some places outside of math mode where you will want to be careful to remove these blank spaces, such as when doing italics or boldface.

Learning TeX and Sample Files

Although FASTEX is intended for the experienced TeX user to enable them to type faster and more accurately, we have also included some sample files and some suggested style files on the disk to help the novice get going. Most people find that it is easier to examine a sample file and emulate it than to try to create one from scratch using a TeX manual. If you are learning TeX for the first time, you might also find the shortcut "bda" (standing for "begin document article") helpful. It will put the necessary things into the beginning of your document to enable you to get started. Remember to also use "ed" (standing for "end document" that will expand to "\end{document}") at the end. In these ways, FASTEX can be a helpful aid for those learning LaTeX.

The Shortcuts

What follows is a list of the available shortcuts and what they become when typeset, grouped according to type. At the end of the manual is an alphabetical listing of all shortcuts. If you create your own shortcuts, TypeIt4Me will generate this alphabetical list.

Generic Commands

To the extent possible, the following general rules have been followed. However, to avoid conflicts, some exceptions are necessary.

- b stands for boldface
- c for capital letters
- cc for capital calligraphic (script) letters
- d for the $ sign and things enclosed in $ signs
- f for fractions
- g for German (fraktur) characters
- h for superscripts
- l for subscripts
- mx for matrices
- o for open font
- w for words in the vocabulary
- W for words that start with a capital
- x for greek letters

These rules may sometimes be combined; for example, "xcl" gives "\Lambda", and "dca" gives "A".

Closing Braces

Please note that there are many commands with opening braces. Wherever these occur, you must complete the command with a matching end brace.

The Next Upgrade

The next version of FASTEX will improve the "universal" shortcuts by providing parentheses that come in pairs and cursor movement capabilities. To ensure notification be sure to send in your registration card. If you choose not do use FASTEX,

give it to a friend!

Contents

1 Basic Formatting

1.1 Setting up a Paper

tebd	\input amssym.def \input amssym \documentstyle{article} \newfont{\tenbi}{cmbbxti10} \begin{document}	template for all input information needed in this manual
temar	\textwidth 6.5 truein \oddsidemargin 0 truein \evensidemargin -0.50 truein \topmargin -.5 truein \textheight 8.5in	template for changing margin sizes insert after document opener
teaut	\title{...} \author{...} \thanks{...} \date{...} \maketitle	template for title and author
teabs	\begin{abstract} \end{abstract}	template for abstract
teack	\noindent{\bf Acknowledgments}	template for acknowledgments
teref	\section*{References} \begin{description} \item \end{description}	template for references
bdo	\begin{document}	
ed	\end{document}	

1.2 Format

sn	\section{	numbered section
sns	\section*{	unnumbered section
ssn	\subsection{	numbered subsection
ssns	\subsection*{	unnumbered subsection
bec	\begin{center}	centers intermediate text
ec	\end{center}	
cl	\centerline{	centers a line
hfi	\hfill	fills line with horizontal space
bfll	\begin{flushleft}	places text flush with left margin
efll	\end{flushleft}	
bflr	\begin{flushright}	places text flush with right margin
eflr	\end{flushright}	
bqt	\begin{quotation}	offsets intermediate text by wider margins
eqt	\end{quotation}	
noi	\noindent	new paragraph starts without indent
nl	\\	newline
np	\newpage	starts new page
pt	%	following text on same line is invisible

1.3 Basic Braces and Parentheses

ob	{	open brace, see also various \begin commands
eb	}	closing (end) brace
eit	\/}	end brace for italics
op	(	open parenthesis
ep	)	end parenthesis
obk	[	open bracket
ebk	]	end bracket
llb	\{	left literal braces
rlb	\}	right literal braces
bqm	“	begin quotation mark
eqm	”	end quotation mark
lle	⟨	\langle
rle	⟩	\rangle

1.4 Lists and Tables

ben	\begin{enumerate}	makes a numbered list;
ee	\end{enumerate}	
bitm	\begin{itemize}	makes list with bullets;
eitm	\end{itemize}	
bds	\begin{description}	makes an unnumbered list;
eds	\end{description}	
itm	\item	produces items for above lists
itmu	\item[	for customized items, in enumerate lists
setc	\setcounter{enumi}{	sets counter for enumerate list
setcu	\setcounter{...}{...}	fill in braces (don't leave spaces)
btb	\begin{tabbing}	starts tabbing environment
etb	\end{tabbing}	
tb	\ >	next tab stop
btr	\begin{tabular}{|c|c|}	tabular with vertical lines
etr	\end{tabular}	
hlin	\hline	horizontal line
ad	&	separates columns in tabular environment

1.5 Labels, References and Bibliography

ftn	\footnote{	footnote
idu	\index{	use for index entries
lbl	\label{	to label an equation, theorem, etc.
refr	\ref{	to cross reference an equation, theorem, etc.
refp	(\ref{ })	put cursor between { } by hand

The following are designed for the author-year style of bibliography that is used within the LaTeX "description" environment (see §1.4).

biba	\item Author [year] Title. {\it Journal\/} {\bf 11}, 123–223.	for articles
bibb	\item Author [year] {\it Title.\/} Publisher.	for books

1.6 Foreign Accents

ae;	ace	é	É	\'{e}	\'{E}
ge;	gce	è	È	\`{e}	\`{E}
ua;	uca	ä	Ä	\"{a}	\"{A}
uo;	uco	ö	Ö	\"{o}	\"{O}
uu;	ucu	ü	Ü	\"{u}	\"{U}

1.7 Miscellaneous

ats	@	@	at symbol
cprt	©	\copyright	copyright
para	¶	\P	paragraph
sect	§	\S	section
gss	ß	\ss	german ss

1.8 Spaces

vsp	\vspace{0.2in}	vertical space 0.2in
hsp	\hspace{0.2in}	horizontal space 0.2in
csp	\quad	single character space
dsp	\qquad	double space
ssp	\,	small space
msp	\:	medium space; only in math mode
tsp	\;	thick space; only in math mode
nsp	\!	negative space; only in math mode
ndsp	\! \!	negative double space; only in math mode

2 Basic Mathematical Formatting

2.1 Equation Commands

The letters "d" and "D" produce $ signs for math environment. **Substitutes for the actual letters are: for "d"—a small d—use "sd" and for "D"—a capital D—use "cd" .**

d	$	starts and terminates in-text formulas
bdp	\[	displayed one line formula, not numbered
edp	\]	
beq	\begin{equation}	displayed one line formula, numbered
beql	\begin{equation}\label{	add label
eeq	\end{equation}	
bqa	\begin{eqnarray}	displayed multiline formula, numbered;
bqal	\begin{eqnarray}\label{	add label
eqa	\end{eqnarray}	
bqas	\begin{eqnarray*}	displayed multiline formula, not numbered
eqas	\end{eqnarray*}	
bea	\begin {array}{ccc}	produces matrices (see also §5.3)
ea	\end{array}	
ad	&	use between columns
ada	& = &	for aligning equals in equation arrays
nonu	\nonumber	suppresses numbering
mbe	\mbox{ }	use before − and + signs in split equations
boxu	\quad \mbox{. . . }\quad	for text within a formula
boxa	\quad \mbox{and}\quad	makes box "and" within a formula
lequ	\begin{eqnarray}	numbered equation split over two lines,
	\lefteqn{ } \nonumber \\	for equations with long lefthand sides
	& &	use "lequs" for the unnumbered version
	\end\{eqnarray}	

2.2 Basic Displayed Equations – Examples

bdpex \[

$$F(b) - F(a) = \int_a^b f(x)dx$$

beqex \begin{equation}

$$F(b) - F(a) = \int_a^b f(x)dx \tag{1}$$

eqtx \[containing text

$$\sum_{i=1}^{n} x_i^2 + y_i^2 \geq 0 \quad \text{for all real numbers } x_i \text{ and } y_i$$

bqasex \begin{eqnarray*}

$$\begin{aligned} x^2 &= y + 1 \\ z^2 + 1 &= u + v \end{aligned}$$

bqaex \begin{eqnarray}

$$\begin{aligned} x^2 &= y + 1 \qquad (2) \\ z^2 + 1 &= u + v \qquad (3) \end{aligned}$$

eqng \begin{eqnarray} \begin{array}{c} numbered as a group

$$\begin{aligned} a &= b + c \\ d &= e + f + g \end{aligned} \tag{4}$$

eqsp \begin{eqnarray*} split (with leading minus sign on second line)

$$\begin{aligned} a &= b + c + (c + d) \\ &\quad - e + f \end{aligned}$$

2.3 Specialized Displayed Equations – Examples

eqbrl \begin{equation} \begin{array}{l}

$$\left.\begin{array}{l} x = y \\ a = b^2 + b + 1 \end{array}\right\} \tag{5}$$

eqbrc \begin{equation} \begin{array}{c}

$$\left.\begin{array}{c} x = y \\ a = b^2 + b + 1 \end{array}\right\} \tag{6}$$

eqbox \begin{equation} \fbox{

$$\boxed{\frac{x^2+1}{5} = y} \tag{7}$$

eval evaluation of expression

$$f\left(\frac{t}{2}\right)\Big|_{t=0}$$

lequex \begin{eqnarray}\lefteqn{ }

$$\begin{aligned} & ax^2 + 2bxy + cy^2 + dx + ey + f \\ = \quad & \alpha u + \beta v + \gamma w + \delta \end{aligned} \tag{8}$$

eabb equation array with big brackets on different lines

$$\begin{aligned} \hat{H}_c(\Delta\omega): \quad = \quad & \int_D \left[\frac{1}{2}\Delta\omega(-\nabla^2)^{-1}\Delta\omega + \Phi(\omega_e + \Delta\omega) - \Phi(\omega_e)\right. \\ & \left. - \Phi'(\omega_e)\Delta\omega\right] dx\, dy \end{aligned}$$

eabr equation array with big braces on different lines

$$\begin{aligned} H_0^s(TM) \quad = \quad & \left\{ X \in H^s(TM) \,\middle|\, \text{there exists an } H^s\text{-extension} \right. \\ & \left. \tilde{X} \in H^s(\tilde{T}M) \text{ with } X \text{ zero on } \tilde{M}\backslash M \right\}. \end{aligned}$$

2.4 Theorem Like Environments

mcor	\newtheorem{cor}{Corollary}	to make new series of Corollaries
mdfn	\newtheorem{dfn}{Definition}	to make new series of Definitions
mlem	\newtheorem{lem}{Lemma}	to make new series of Lemmas
mprop	\newtheorem{prop}{Proposition}	to make new series of Propositions
mthm	\newtheorem{thm}{Theorem}	to make new series of Theorems
bcor	\begin{cor}	to begin a Corollary
ecor	\end{cor}	to end a Corollary
bdfn	\begin{dfn}	
edfn	\end{dfn}	
blem	\begin{lem}	
elem	\end{lem}	
bprop	\begin{prop}	
eprop	\end{prop}	
bthm	\begin{thm}	
bthmt	\begin{thm}[Gauss' Theorem]	to begin a Theorem with title
ethm	\end{thm}	
exa	**Example**	\noindent{\large \bf Example\,}
rmk	**Remarks**	\noindent{\large \bf Remarks\,}
prf	**Proof**	\noindent{\bf Proof\,}
sol	**Solution**	\noindent{\bf Solution\,}

2.5 End of Proofs, etc.

blackl	⧫	\quad \blacklozenge	
dblackl	⧫	\quad $\blacklozenge$	
epr	■	\quad \blacksquare	end proof
dep	■	\quad $\blacksquare$	dollar end proof
esq	□	\quad \square	empty square
desq	□	\quad $\square$	dollar empty square
etd	▽	\quad \bigtriangledown	empty triangle down
detd	▽	\quad $\bigtriangledown$	dollar empty triangle down
btd	▼	\quad \blacktriangledown	black triangle down
dbtd	▼	\quad $\blacktriangledown$	dollar black triangle down

3 Alphabets and Fonts

3.1 Greek Letters

All greek letters are available as sub- and superscripts by preceding the codes below with "l" or "h". For example, "lxa" is "_\alpha" and "hxa" is "^\alpha". They are also available enclosed by $, for example "dxa" produces "$\alpha $".

xa	α	\alpha			
xb	β	\beta			
xg	γ	\gamma	xcg	Γ	\Gamma
xd	δ	\delta	xcd	Δ	\Delta
xe	ϵ	\epsilon			
xve	ε	\varepsilon			
xz	ζ	\zeta			
xet	η	\eta			
xth	θ	\theta	xcth	Θ	\Theta
xvth	ϑ	\vartheta			
xio	ι	\iota			
xk	κ	\kappa			
xl	λ	\lambda	xcl	Λ	\Lambda
xm	μ	\mu			
xn	ν	\nu			
xp	π	\pi	xcp	Π	\Pi
xvp	ϖ	\varpi			
xr	ρ	\rho			
xvr	ϱ	\varrho			
xs	σ	\sigma	xcs	Σ	\Sigma
xvs	ς	\varsigma			
xt	τ	\tau			
xu	υ	\upsilon	xcu	Υ	\Upsilon
xph	ϕ	\phi	xcph	Φ	\Phi
xvph	φ	\varphi			
xc	χ	\chi			
xps	ψ	\psi	xcps	Ψ	\Psi
xo	ω	\omega	xco	Ω	\Omega

3.2 Italics, Bold, etc.

For the universal blank bricks, use "...u" (universal). To complete it, after typing the entry, use "eb" and "eit". [Note about "bi": If you do your papers in 12pt, modify the definition of \tenbi at the beginning.]

itu	*example*	{\it	*italic* type, "eit" to finish
biu	***example***	{\tenbi	***bold italic*** type,"eit" to finish
rmu	example	{\rm	roman type
bfu	**example**	{\bf	**boldface** type
scu	EXAMPLE	{\sc	SMALL CAPS type
sfu	example	{\sf	sans serif type
slu	*example*	{\sl	*slanted* type
ttu	`example`	{\tt	`typewriter` type
emu	*example*	{\em	*emphasized* type
bxu	$\boldsymbol{\xi}$	\mbox{\boldmath$...$}	
cau	$\mathcal{A}$	{\cal	only in math mode, only cap.letters
gmu	$\mathfrak{g}$	\frak	only in math mode
opu	$\mathbb{R}$	{\Bbb	only in math mode

3.3 Boldface Letters

bfu		{\bf	
b0 – b10	**0** – **10**	{\bf 0} – {\bf 10}	
ba – bd	**a** – **d**	{\bf a} – {\bf d}	
bee	**e**	{\bf e}	(because of the word "be")
bff	**f**	{\bf f}	(because of the command "bf")
bg – bx	**g** – **x**	{\bf g} – {\bf x}	
byy	**y**	{\bf y}	(because of the word "by")
bz	**z**	{\bf z}	
bca – bcz	**A** – **Z**	{\bf A} – {\bf Z}	
bel1	$\mathbf{e}_1$	{\bf e}_1	also bel2, bel3, beln

3.4 Boldmath Symbols

bxu		\mbox{\boldmath$...$}
bxo	$\boldsymbol{\omega}$	\mbox{\boldmath$\omega$}
bxx	$\boldsymbol{\xi}$	\mbox{\boldmath$\xi$}

3.5 Calligraphic Letters

cau		{\cal	only in math mode, cap. letters
cca – ccz	$\mathcal{A}$ – $\mathcal{Z}$	{\cal A} –{\cal Z}	also as dcca – dccz ($ $\mathcal{A}$ $ – $ $\mathcal{Z}$ $)

3.6 German (Fraktur) Letters

gmu		\frak...	only in math mode
gmb	$\mathfrak{b}$	\frak b	german b, also as dgmb
gmg	$\mathfrak{g}$	\frak g	german g, also as dgmg
gmh	$\mathfrak{h}$	\frak h	german h, also as dgmh
gmk	$\mathfrak{k}$	\frak k	german k, also as dgmk
gmp	$\mathfrak{p}$	\frak p	german p, also as dgmp
gmt	$\mathfrak{t}$	\frak t	german t, also as dgmt
gmca	$\mathfrak{A}$	\frak A	german A, also as dgmca
gmcg	$\mathfrak{G}$	\frak G	german G, also as dgmcg
gmch	$\mathfrak{H}$	\frak H	german H, also as dgmch
gmck	$\mathfrak{K}$	\frak K	german K, also as dgmck
gmct	$\mathfrak{T}$	\frak T	german T, also as dgmct
gmcx	$\mathfrak{X}$	\frak X	german X, also as dgmcx

3.7 Open Letters

opu		{\Bbb	only in math mode
opcc	$\mathbb{C}$	{\Bbb C}	also as dopcc: $ $\mathbb{C}$ $
opci	$\mathbb{I}$	{\Bbb I}	dopci
opcr	$\mathbb{R}$	{\Bbb R}	dopcr
opcr1	$\mathbb{R}^1$	{\Bbb R}^1	dopcr1
opcr2	$\mathbb{R}^2$	{\Bbb R}^2	dopcr2
opcr3	$\mathbb{R}^3$	{\Bbb R}^3	dopcr3
opcrm	$\mathbb{R}^m$	{\Bbb R}^m	dopcrm
opcrn	$\mathbb{R}^n$	{\Bbb R}^n	dopcrn
opct	$\mathbb{T}$	{\Bbb T}	dopct
opcz	$\mathbb{Z}$	{\Bbb Z}	dopcz

4 Basic Mathematical Operations and Symbols

4.1 Universal Operations

fu, fof, eb		\frac{ }{}	for general fractions
squ	$\sqrt{}$	\sqrt{	universal square root
hu		$\hat{}$	superscript universal
lu		_{	subscript universal
limu	lim	\lim_{	limit universal
ovu	$\vec{a}$	\vec{	
olu	$\overline{a}$	\overline{	
obu	$\bar{a}$	\bar{	
ocu	$\check{a}$	\check{	
odu	$\dot{a}$	\dot{	
oddu	$\ddot{a}$	\ddot{	
ohu	$\hat{a}$	\hat{	
otu	$\tilde{a}$	\tilde{	
setu	{|}	{\mid}	in-line set
setlu	{|}	\left\{ \left. \! \right| \right\}	sized set for large displays
disu		{\displaystyle	for larger math mode formulas

4.2 Single Symbols included in $ Signs

da – dz	$a - z$	a – z	(except: "doo" for o)
dca – dcz	$A - Z$	A – Z	
d1 – d10	$1 - 10$	1 – 10	
dba – dbz	$\mathbf{a} - \mathbf{z}$	${\bf a}$ – ${\bf z}$	
dbca – dbcz	$\mathbf{A} - \mathbf{Z}$	${\bf A}$ – ${\bf Z}$	
db0 – db10	$\mathbf{0} - \mathbf{10}$	${\bf 0}$ – ${\bf 10}$	

4.3 Roots

sq2	$\sqrt{2}$	\sqrt{2}	also $\sqrt{3}, \sqrt{5}, \sqrt{7}, \sqrt{10}$
sqxp	$\sqrt{\pi}$	\sqrt{\pi}	
cr2	$\sqrt[3]{2}$	\sqrt[3]{2}	cube root over 2
nr2	$\sqrt[n]{2}$	\sqrt[n]{2}	n-root over 2

4.4 Specific Fractions

f12, haf	$\frac{1}{2}$	\frac{1}{2}
f13	$\frac{1}{3}$	\frac{1}{3}
f14	$\frac{1}{4}$	\frac{1}{4}
fddt	$\frac{d}{dt}$	\frac{d}{dt}
fdudt	$\frac{du}{dt}$	\frac{du}{dt}
fdxdt	$\frac{dx}{dt}$	\frac{dx}{dt}
fdydt	$\frac{dy}{dt}$	\frac{dy}{dt}
fdzdt	$\frac{dz}{dt}$	\frac{dz}{dt}
fpx	$\frac{\partial}{\partial x}$	\frac{\partial}{\partial x}
fpy	$\frac{\partial}{\partial y}$	\frac{\partial}{\partial y}
fpzx	$\frac{\partial z}{\partial x}$	\frac{\partial z}{\partial x}
fps	$\frac{\partial^2}{\partial x \partial y}$	\frac{\partial^2}{\partial x \partial y}
fpt	$\frac{\partial^3}{\partial x \partial y \partial z}$	\frac{\partial^3}{\partial x \partial y \partial z}

4.5 Superscripts

All letters, capital letters and numbers from 0 to 10 are available as superscripts, by preceding the desired letter or number with "h". E.g. "ha" gives ^a, "hca" gives "^A", "h1" gives "^1". Exceptions, to avoid conflict with words and the universal macro, are "hee" for superscript e, "huu" for superscript u.

hu	$^{$		high universal
ha – hz	^{a} – ^{z}	^a – ^z	(except: "hee" for ^{e}, "huu" for ^{u})
hca – hcz	^{A} – ^{Z}	^A – ^Z	
h0 – h10	^{0} – ^{10}	^0 – ^{10}	
sq	^{2}	^2	to avoid typing the number
cu	^{3}	^3	to avoid typing the number
xq, yq, zq	x^2, y^2, z^2	x^2, y^2, z^2	
hmo	$^{-1}$	^{-1}	
hij	$\hat{ij}$	\hat{ij}	
hijk	$\hat{ijk}$	\hat{ijk}	
hjk	$\hat{jk}$	\hat{jk}	
hdg	†	^\dagger	
hprp	$^{\perp}$	^\perp	
hpr	$^{\prime}$	^\prime	
hst	*	^\ast	
hvst	*	^\star	

4.6 Subscripts

All letters, capital letters and numbers from 0 to 10 are available as subscripts, preceding with "l". E.g. "la" gives "_a", "lca" gives "_A", "l1" gives "_1".

lu	_{		low universal
la – lz	$_{a}$ – $_{z}$	_a – _z	(except: "luu" for $_{u}$)
lca – lcz	$_{A}$ – $_{Z}$	_A – _Z	
l0 – l10	$_{0}$ – $_{10}$	_0 – _{10}	
lij	$_{ij}$	_{ij}	
lijk	$_{ijk}$	_{ijk}	
ljk	$_{jk}$	_{jk}	
yln	y_n	y_n	
zln	z_n	z_n	
lst	$_{*}$	_\ast	
lvst	$_{\star}$	_\star	

4.7 Overcharacters

obp	$\bar{p}$	\bar{p}	also $\bar{q}, \bar{r}, \bar{s}, \bar{x}, \bar{y}, \bar{z}$
obxa	$\bar{\alpha}$	\bar{\alpha}	also $\bar{\beta}, \bar{\gamma}$
odp	$\dot{p}$	\dot{p}	also $\dot{q}, \dot{r}, \dot{s}, \dot{x}, \dot{y}, \dot{z}, \dot{\alpha}, \dot{\beta}, \dot{\gamma}$
oddp	$\ddot{p}$	\ddot{p}	also $\ddot{q}, \ddot{r}, \ddot{s}, \ddot{x}, \ddot{y}, \ddot{z}, \ddot{\alpha}, \ddot{\beta}, \ddot{\gamma}$
olp	$\overline{p}$	\overline{p}	also $\overline{q}, \overline{r}, \overline{s}, \overline{x}, \overline{y}, \overline{z}, \overline{\alpha}, \overline{\beta}, \overline{\gamma}$
ohp	$\hat{p}$	\hat{p}	also $\hat{q}, \hat{r}, \hat{s}, \hat{x}, \hat{y}, \hat{z}, \hat{\alpha}, \hat{\beta}, \hat{\gamma}$
ova	$\vec{a}$	\vec{a}	also $\vec{b}, \vec{c}, \vec{v}, \vec{w}$
vcpp	$\overrightarrow{\mathrm{PP}}$	\stackrel{\textstyle\longrightarrow}{\rm PP}; also dvcpp	
vcpq	$\overrightarrow{\mathrm{PQ}}$	\stackrel{\textstyle\longrightarrow}{\rm PQ}; also dvcpq	

4.8 Binary Operations and Relations

pl	$+$	+	plus
mi	$-$	-	minus
plm	$\pm$	\pm	plus-minus
mip	$\mp$	\mp	minus-plus
divi	$\div$	\div	divide
cir	$\circ$	\circ	composite
blt	$\bullet$	\bullet	bullet
opl	$\oplus$	\oplus	direct sum
omi	$\ominus$	\ominus	direct difference
ti	$\times$	\times	times
oti	$\otimes$	\otimes	tensor product
sdp	Ⓢ	\,\circledS\,	semi direct product
wed	$\wedge$	\wedge	wedge product
eq	$=$		equals
ez	$= 0$		equals zero
gte	$\geq$	\geq	greater than or equal
lte	$\leq$	\leq	less than equal
ne	$\neq$	\neq	not equal
iso	$\cong$	\cong	isomorphic
eqv	$\equiv$	\equiv	equivalent
mlt	$\ll$	\ll	much less than
mgt	$\gg$	\gg	much greater than
apx	$\approx$	\approx	approximately

4.9 Sized Parentheses

lep	(	\left(	The "left" and "right" commands
rip	)	\right)	effect the size of the braces.
lebk	[	\left[	They always have to appear in pairs!
ribk	]	\right]	Invisible braces are made with \left. and \right.
lebr	{	\left\{	
ribr	}	\right\}	
lel	⟨	\left\langle	
lld	⟪	\left\langle \! \left\langle	
rir	⟩	\right\rangle	
rrd	⟫	\right\rangle \! \right\rangle	
ldo		\left.	
rdo		\right.	

4.10 Single Mathematical Symbols

ale	ℵ	\aleph	aleph
hba	ℏ	\hbar	Planck's constant
prm	′	\prime	prime, use "hpr" for superscript
flt	♭	\flat	flat sign, "hfl" for superscript
shp	♯	\sharp	sharp sign, "hsh" for superscript
sh	♡	\heartsuit	sweetheart
ppt	∝	\propto	proportional to
nrm	‖	\ |	
lied	£	\pounds	Lie derivative
trv	⫛	\pitchfork	transversal
scl	ℓ	\ell	script l
nrm	‖	\\|	norm
na	∇	\nabla	nabla
pd	∂	\partial	partial derivative
infi	∞	\infty	infinity
wpf	℘	\wp	Weierstrass p-function
rea	ℜ	\Re	real part alternate
ima	ℑ	\Im	imaginary part alternate
angl	∠	\angle	angle

4.11 Set Theoretic Symbols

imp	$\Rightarrow$	\Rightarrow	implies
impb	$\Leftarrow$	\Leftarrow	implied by
olra	$\Leftrightarrow$	\Leftrightarrow	equivalent to
emp	$\varnothing$	\varnothing	empty set
empa	$\emptyset$	\emptyset	empty set alternate
eo	$\in$	\in	element of
neo	$\notin$	\not\in	not an element of
setm	$\setminus$	\setminus	set difference
subs	$\subset$	\subset	subset
sube	$\subseteq$	\subseteq	subset or equals
sups	$\supset$	\supset	superset
supe	$\supseteq$	\supseteq	superset or equals
ints	$\cap$	\cap	intersection
bint	$\bigcap$	\bigcap	big intersection
uni	$\cup$	\cup	union
buni	$\bigcup$	\bigcup	big union
vbar	$\mid$	\mid	vertical bar, with spacing
te	$\exists$	\exists	there exists
fa	$\forall$	\forall	for all

4.12 Arrows and Dots

artl	$\mapsto$	\mapsto	arrow with tail
ra	$\rightarrow$	\rightarrow	rightarrow
lora	$\longrightarrow$	\longrightarrow	longrightarrow
lra	$\leftrightarrow$	\leftrightarrow	leftrightarrow
lea	$\leftarrow$	\leftarrow	leftarrow
upa	$\uparrow$	\uparrow	uparrow
uhr	$\upharpoonright$	\upharpoonright	upharpoonright
sur	$\nearrow$	\nearrow	slanted up right
sdr	$\searrow$	\searrow	slanted down right
cdo	$\cdot$	\cdot	centered dot
cds	$\cdots$	\cdots	centered dots
dds	$\ddots$	\ddots	diagonal dots
lds	$\ldots$	\ldots	lower dots
vds	$\vdots$	\vdots	vertical dots

4.13 Trig Functions

co	cos	\cos	
coh	cosh	\cosh	hyperbolic cosine
coq	$\cos^2$	\cos^2	cosine squared
coth	$\cos\theta$	\cos \theta	cosine of theta
coph	$\cos\phi$	\cos \phi	cosine of phi
si	sin	\sin	
sih	sinh	\sinh	hyperbolic sine
siq	$\sin^2$	\sin^2	sine squared
sith	$\sin\theta$	\sin \theta	sine of theta
siph	$\sin\phi$	\sin \phi	sine of phi
seh	sech	{\rm sech}\,	hyperbolic sech
tn	tan	\tan	
tnh	tanh	\tanh	hyperbolic tangent

4.14 Log-like Symbols

ex	exp	\exp	exponential
logg	log	\log	logarithm
lgn	ln	\ln	natural logarithm
supr	sup	\sup	supremum
infm	inf	\inf	infimum
mx	max	\max	maximum
mn	min	\min	minimum
limu	lim	\lim	limit universal
limi	$\liminf$	\liminf	limit inferior
lims	$\limsup$	\limsup	limit superior
dtt	det	\det	determinant
kr	ker	\ker	kernel
dmn	dim	\dim	dimension
ag	arg	\arg	argument
gc	gcd	\gcd	greatest common divisor

4.15 Combinations of Mathematical Symbols

mo	-1	-1	minus one
nrbu	$\|\mathbf{u}\|$	\ | {\bf u} \ |	
ava	$\|a\|$	|a|	absolute value; also $\|b\|, \|c\|, \|x\|, \|y\|, \|z\|$
shl	$A^i{}_a$	A^i_{\;a}	staggered, high and low
lam	$L_A{}^\mu$	L_A{}^\mu	staggered, variation 1
van	$v^A{}_\nu$	v^A{}_\nu	staggered, variation 2
gmgs	$\mathfrak{g}^*$	\frak g ^{\ast}	german g star; also $\mathfrak{h}^*$, $\mathfrak{k}^*$
dgmgs	$\mathfrak{g}^*$	$\frak g ^{\ast}$	also dgmhs, dgmks
gmso3	$\mathfrak{so}(3)$	\frak{so}(3)	also dgmso3
so3	$so(3)$	so(3)	also dso3
cso3	$SO(3)$	SO(3)	also dcso3
tsq	T^*Q	T^\ast Q	also dtsq
tsqq	T^*_qQ	T^{\ast}_{q} Q	also dtsqq
divg	div	{\rm div}\,	divergence
au	Aut(	{\rm Aut}(	automorphism universal
difu	Diff(	{\rm Diff}(	diffeomorphism universal
imu	Im(	{\rm Im}(	real part universal
imz	Im(z)	{\rm Im}(z)	real part of z
reu	Re(	{\rm Re}(	real part universal
rez	Re(z)	{\rm Re}(z)	real part of z
0p	(0)		also as d0p
00p	$(0,0)$		also as d00p
03p	$(0,0,0)$		also as d03p
triap	(a_1,a_2,a_3)		also dtriap
xyp	(x,y)		also dxyp
xyzp	(x,y,z)		also dxyzp
xpyq	x^2+y^2		also dxpyq
dxdy	$dx\,dy$		
dxdydz	$dx\,dy\,dz$		
dydt	dy/dt	dy/dt	
dxdt	dx/dt	dx/dt	
dzdt	dz/dt	dz/dt	
pdzy	$\partial z/\partial y$	\partial z/\partial y	also dpdzy
aplb	$\mathbf{a}+\mathbf{b}$	{\bf a} + {\bf b}	
atib	$\mathbf{a}\times\mathbf{b}$	{\bf a} \times {\bf b}	
atibp	$(\mathbf{a}\times\mathbf{b})$	({\bf a} \times {\bf b})	

5 Integrals, Sums, Products and Matrices

5.1 Integrals

intu	$\int$	\int	integral universal; add limits with “hu” and “lu”
intd	$\iint$	\int \!\!\! \int	double integral
intt	$\iiint$	\int \!\!\!\int \!\!\!\int	triple integral
intc	$\oint$	\oint	contour integral
i10	$\int_0^1$	\int^1_0	
iba	$\int_a^b$	\int^b_a	
ilcd	$\int_D$	\int_D	
ir3	$\int_{\mathbb{R}^3}$	\int_{{\Bbb R}^3}	
iinf	$\int_{-\infty}^{\infty}$	\int^\infty_{-\infty}	
i2xp0	$\int_0^{2\pi}$	\int^{2 \pi}_0	

5.2 Sums, Limits, etc.

sumu	$\sum$	\sum	$\sum$	(in-text)
sni1	$\sum_{i=1}^{n}$	(displayed)	$\sum_{i=1}^{n}$	(in-text)
pni1	$\prod_{i=1}^{n}$	(displayed)	$\prod_{i=1}^{n}$	(in-text)
uni1	$\bigcup_{i=1}^{n}$	(displayed)	$\bigcup_{i=1}^{n}$	(in-text)
ini1	$\bigcap_{i=1}^{n}$	(displayed)	$\bigcap_{i=1}^{n}$	(in-text)
li00	$\lim_{(x,y)\to(0,0)}$	(displayed)	$\lim_{(x,y)\to(0,0)}$	(in-text)
liai	$\lim_{a\to\infty}$	(displayed)	$\lim_{a\to\infty}$	(in-text)
lixl0	$\lim_{x\to x_0}$	(displayed)	$\lim_{x\to x_0}$	(in-text)

5.3 Sample Matrices

mxc $\left(\begin{array}{c} x_1 \\ x_2 \\ x_3 \end{array} \right)$ \left(\begin{array}{c} x_1 \\ x_2 \\ x_3 \end{array} \right)

mxca $\left[\begin{array}{c} x \\ y \end{array} \right]$ \left[\begin{array}{c} x \\ y \end{array} \right]

mxp $\left(\begin{array}{cc} a & b \\ c & d \end{array} \right)$ \left(\begin{array}{cc} a & b \\ c & d \end{array} \right)

mxbk $\left[\begin{array}{cc} a & b \\ c & d \end{array} \right]$ \left[\begin{array}{cc} a & b \\ c & d \end{array} \right]

mxi $\left[\begin{array}{cc} 1 & 0 \\ 0 & 1 \end{array} \right]$ \left[\begin{array}{cc} 1 & 0 \\ 0 & 1 \end{array} \right]

mxs $\left[\begin{array}{cc} 0 & 1 \\ -1 & 0 \end{array} \right]$ \left[\begin{array}{cc} 0 & 1 \\ - 1 & 0 \end{array} \right]

mx3i $\left(\begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right)$ \left(\begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right)

mx3d $\left| \begin{array}{ccc} a & b & c \\ d & e & f \\ g & h & i \end{array} \right|$ \left| \begin{array}{ccc} a & b & c \\ d & e & f \\ g & h & i \end{array} \right|

mx3 $\left(\begin{array}{ccc} a & b & c \\ d & e & f \\ g & h & i \end{array} \right)$ \left(\begin{array}{ccc} a & b & c \\ d & e & f \\ g & h & i \end{array} \right)

mx35pt $\left[\begin{array}{ccc} a & b & c \\ d & e & f \\ g & h & i \end{array} \right]$ \left[\begin{array}{ccc} a & b & c \\ d & e & f \\ g & h & i \end{array} \right]

6 Boxes, Tabbing and Tabular Environment Samples

6.1 Boxes

frbox1 **Note:** text framed box, edit its size

frbox2 **type header**
text framed box, edit its size

dfrbox **type header**
text double framed box, edit its size

6.2 Tabbing

tbex1 tabbing example 1

items	for	row	one
items	for	row	two

6.3 Tabular

tabex1 tabular example 1 (5 columns)

$$\begin{array}{ccccc} & & & \text{Definition} & \\ & & & \text{of derivative} & \\ & & & \downarrow & \\ \text{Partials exist and} & \Longrightarrow & \text{Differentiable} & \Longrightarrow & \text{Partials exist} \\ \text{are continuous} & & & & \end{array}$$

tabex2 tabular example 2 (2 columns within a fbox-parbox)

Box 2.1.1 Summary of Important Formulas for §2.1

Velocity

$V = \dfrac{\partial \phi}{\partial t}$	$V^a = \dfrac{\partial \phi^a}{\partial t}$
$v_t = V_t \circ \phi_t^{-1}$	$v_t^a = V_t^a \circ \phi_t^{-1}$

Covariant Derivative

$\mathbf{D}v \cdot w = \nabla_w v$	$(\nabla_w v)^a = \dfrac{\partial v^a}{\partial x^b} w^b + \gamma^a_{bc} w^b v^c$

tabex3 tabular example 3 (3 columns without a frame)

Classical Tensor Analysis		*Tensor Analysis on Manifolds*
$\{x^a\}$	Coordinates	$\{x^a\}$
$e_a = \dfrac{\partial z^i}{\partial x^a} \dot{i}_i$	coordinate basis vectors	$\dfrac{\partial}{\partial x^a} = e_a$
$\left.\begin{array}{l} \bar{e}_a = \dfrac{\partial x^b}{\partial \bar{x}^a} e_b \\ \bar{e}^a = \dfrac{\partial \bar{x}^a}{\partial \bar{x}^b} e^b \end{array}\right\}$	change of coordinates	$\left\{\begin{array}{l} \dfrac{\partial}{\partial \bar{x}^a} = \dfrac{\partial x^b}{\partial \bar{x}^a} \dfrac{\partial}{\partial x^b} \\ d\bar{x}^a = \dfrac{\partial \bar{x}^a}{\partial x^b} dx^b \end{array}\right.$

tabex4 tabular example 4 (2 columns with lines)

Classical Mechanics	**Quantum Mechanics**
immersed Lagrangian manifold $\Lambda \to (T^*Q, \Omega)$	element of $L^2(Q)$ or $\mathcal{D}'(Q)$
Λ = graph of $\mathbf{d}S$	$\psi = \exp(iS/\hbar)$
T^*Q	Hilbertspace
Lagrangian manifold $\Omega \subset (T^*Q, \Omega_Q) \times (T^*R, -\Omega_R)$	(possibly unbounded) $L^2(R)$ to $L^2(Q)$
composition of canonical relations	composition of operators

tabex5 tabular example 5 (same as tabex4, but within a framed box)

Classical Mechanics	**Quantum Mechanics**
immersed Lagrangian manifold $\Lambda \to (T^*Q, \Omega)$	element of $L^2(Q)$ or $\mathcal{D}'(Q)$
Λ = graph of $\mathbf{d}S$	$\psi = \exp(iS/\hbar)$
T^*Q	Hilbertspace
Lagrangian manifold $\Omega \subset (T^*Q, \Omega_Q) \times (T^*R, -\Omega_R)$	(possibly unbounded) $L^2(R)$ to $L^2(Q)$
composition of canonical relations	composition of operators

tabex6 tabular example 6 (3 columns with lines)

Case	Conditions	Connection
Unconstrained	$\mathcal{D}_q = T_qQ$	$\mathcal{A}^{\mathrm{sym}}(\dot{q}) = \mathbb{I}^{-1}J(\dot{q})$
Purely Kinematic	$\mathcal{D}_q \cap T_q(\mathrm{Orb}(q)) = \{0\}$	$\mathcal{A}^{\mathrm{kin}}(\dot{q}) = 0$
Horizontal symmetries	$\mathcal{D}_q \cap T_q(\mathrm{Orb}(q))_G = T_q(\mathrm{Orb}(q))_H$	$\mathcal{A}^{\mathrm{sym}}(\dot{q}) + \mathcal{A}^{\mathrm{kin}}(\dot{q}) = \mathbb{I}^{-1}J_H(\dot{q})$
General principal bundle case	$\mathcal{D}_q + T_q(\mathrm{Orb}(q)) = T_qQ$	$\mathcal{A}^{\mathrm{sym}}(\dot{q}) + \mathcal{A}^{\mathrm{kin}}(\dot{q}) = \mathbb{I}^{-1}J^{\mathrm{nhc}}(\dot{q})$

7 Pictures and Commutative Diagrams

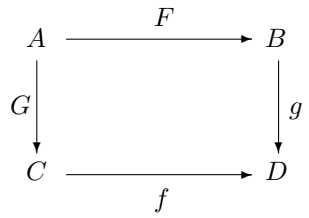
7.1 Pictures

To reference a figure, and to get it placed right after the text citation, or at the top of the next available page you can use the sample style file "artbrick.sty" or the appropriate piece of that file.

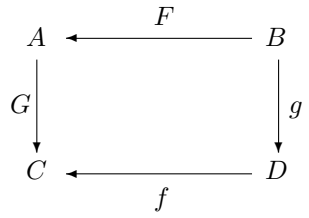
fig	\begin{figure}%notes \vspace{1.5in} \caption{} \end{figure}	to make a space for a figure such as a commutative diagram
pict	\begin{figure}%notes \vspace{2in} \hspace*{.2in} \special{picture typefigname} \caption{} \end{figure}	to insert a picture using copy and paste
illus	\begin{figure}%notes \vspace{2in} \hspace*{.4in} \special{illustration typefigname} \caption{} \end{figure}	to insert an illustration from an encapsulated postscript file such as Adobe illustrator.

7.2 Commutative Diagrams

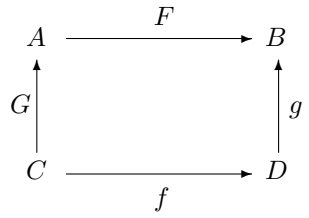
scd1 square commutative diagram 1



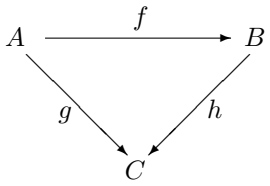
scd2 square commutative diagram 2



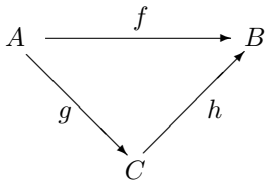
scd3 square commutative diagram 3



tcd1 triangular commutative diagram 1



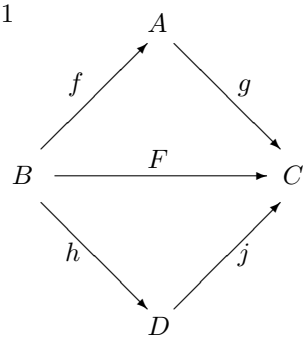
tcd2 triangular commutative diagram 2



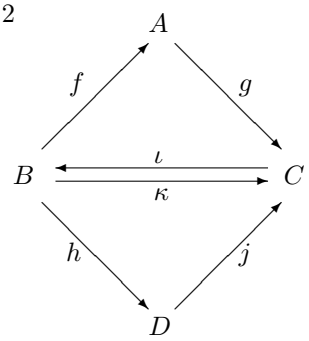
ecd1 exact commutative diagram 1

$$0 \longrightarrow A \xrightarrow{f} B \xrightarrow{g} C \xrightarrow{h} C/g(B) \longrightarrow 0$$

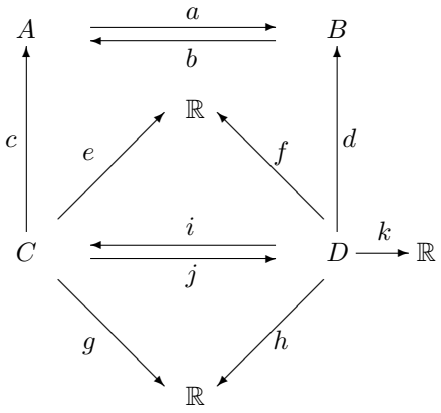
dcd1 double commutative diagram 1



dcd2 double commutative diagram 2



cxcd1 complex commutative diagram 1



8 Vocabulary

Important: If the shortcuts are typed with a capital "W", the word begins with a capital letter, *i.e.,* "Wun" = University

wdm	department of mathematics
wcdm	Department of Mathematics
wdp	department of physics
wcdp	Department of Physics
wace	accelerate
wacs	accelerates
wacn	acceleration
wcle	calculate
wcls	calculates
wcln	calculation
wder	derivative
wders	derivatives
weqn	equation
weqns	equations
wex	example
wfun	function
wfuns	functions
wgm	geometry
wgmc	geometric
wie	i.e.,
wiie	*i.e.,*
wig	integral
wigs	integrals
wigb	integrable
wign	integration
wlig	line integral
wligs	line integrals
wmx	matrix
wneg	negative
wnl	nonlinear
wnly	nonlinearity
wprp	perpendicular
wpos	positive
wrel	relative
wrln	relation
wrtn	rotation
wrts	rotations
wrtg	rotating
wsn	solution
wsns	solutions
wtm	theorem
wtms	theorems
wty	theory
wun	university
wve	vector
wvs	vectors
wvel	velocity

9 Sample Paper Templates

9.1 Paper/Template

9.2 Paper/Simple/Template

9.3 Paper/Simplest/Template

10 Alphabetical List of FASTEX Shortcuts