A Brief KahoeTech© Tutorial

Selwyn Hollis
shollis@appliedsymbols.com

KahoeTech Latin and KahoeTech Greek

1. From KahoeTech Latin, you get the standard TEX "math-mode" Roman alpha-numeric characters plus parentheses, minus/plus/equal signs, etc., by typing the keys that you would expect.

2. KahoeTech Greek is basically the same as KahoeTech Latin but with Greek letters instead of Roman.

3. With KahoeTech Latin and Greek, you can make expressions with simple subscripts and/or superscripts without all the tedious style and kerning adjustments that are normally involved.

- You get lower-case and numerical subscripts by pressing the option key.
- You get lower-case and numerical superscripts by pressing the option and shift keys.
- Superscripts have zero width and behave as if they are preceded by a backspace. This allows you to "stack" subscripts and superscripts by typing the subscript first.
- There are a handful of exceptions to all of the above.

Exceptions:

• The lower case "o" key gets you a 1/3 space, which is handy for tweaking the spacing between characters. In the rare instance when you might actually want an "o", you can get it from "option-e" then "o".

• "Option-o" gets you a zero-width, backspaced "post"-fraction bar. "Option-shift-o" gets you a zero-width, backspaced radical extender bar.

• As you might expect, to get a subscript n, you have to type "option-n" then "n" again. (This is what gets you an ñ in normal fonts.) The same is true with u, i, and e.

Other Features:

• There are subscript and superscript versions of $-$,$+$, $/$, as well as period and comma. Whenever possible, these are obtained in the standard option/option-shift manner described above.

• There are subscript and superscript versions of several upper-case letters. These are AFGNTXYD. The keystrokes make sense sometimes, but usually not.

• There are subscript versions of $=$ and $\rightarrow$.

• There are superscript versions of parentheses.

• It's easy to make simple fractions using subscripts (option) and superscripts (option-shift) together with the zero-width "pre"-fraction bar (option-\) and "post"-fraction bar (option-o). These fraction bars also let you put bars on top of many lower-case letters.

• Leibniz-style derivative and partial derivative operator symbols included. These can be used in conjunction with subscripts (option) and superscripts (option-shift) to get nice derivative symbols.

• Enlarged grouping symbols: $\{[(\ )]\}$.

• Option-space should get you an extra-thin (1/6) space. However this doesn't seem to work in all programs.

Tips:

• You'll have much better luck creating expressions at, say, 24 points or higher than at smaller sizes. Then reduce to 12 points, or whatever. Don't expect small type to look great on the screen, but don't worry either; it will look great when you print it out on a PostScript printer. Also, things will look much better on screen if you have "font smoothing" (anti-aliasing) turned on.

• Zero-width characters do make things a bit weird, because it's hard to tell sometimes exactly where your cursor is. The italic versions of the fonts, which we'll describe later, are made to help with this.

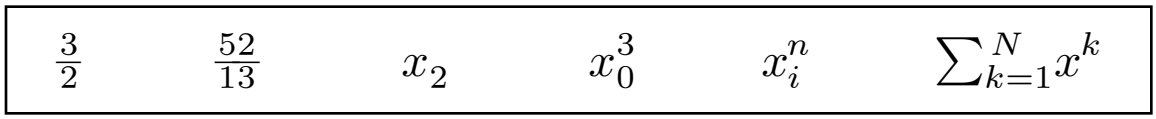
• If you want good results, you'll have to tweak the spacing according to your own eye. (And if you don't have a good eye for such things, you probably don't care about this font anyhow, right?) Use the "o" key liberally (and option-spacebar if it works for you).

• Use PopChar or the Character Palette to help you select characters instead of trying to remember keystrokes. To access the Character Palette, check it under Input Menu in the International Preference Pane. (OS X 10.2.)

• *Turn off smart quotes!!!* If you don't, typing ' will get you }. (You can still get real quote marks in other fonts by typing option-[, option-{, option-], and option-}.)

KahoeTech Latin

What follows will hopefully give you some indication of how simple KahoeTech is to use and some idea of what it will let you do. As you probably gleened from the last page, the main purpose of KahoeTech is to let you easily type superscripts and subscripts. In general, the option key gets you a subscript, and option-shift gets you a superscript. Superscripts behave as if preceded by a backspace. The picture below shows several examples.



The fraction "three-halves" is obtained by typing either

option-\ option-2 option-shift-3

or

option-2 option-shift-3 o option-o.

The fraction "fifty-two over thirteen" is got by typing

option-\ option-1 option-shift-5 o option-3 option-shift-2 o option-o.

The third expression is obtained by simply typing x option-2, the fourth by typing

x option-0 option-shift-3,

and the fifth by typing

x option-i i option-shift-n .

Finally, the summation shown would result from typing

option-e E option-k o o option-n N option-= o o option-1 o x space option-shift-k.

Note the space before the final superscript, since there is no subscript below it.

In the following equation, the "f double-prime" expression is the result of typing

f space ' o o ' (x).

The rest should need no explanation at this point other than to remind you that a space falls between each x and its superscript.

$$f''(x) = 3x^3 + 2x^2 - x + 5$$

Now let's walk through the process of typing "the indefinite integral of the cube-root of 2x+1." First, use the Character Palette to locate the integral sign (shift-3). Now type two spaces followed by option-shift 3. Then use the Character Palette to locate the radical (option-shift-').

$$\int \sqrt[3]{\ }$$

Now increase the point size of the integral sign a bit.

$$\int \sqrt[3]{\ }$$

Then typing 2xo+o1 gives this:

$$\int \sqrt[3]{2x+1}$$

The Character Palette shows the radial extender next to the radical itself (option-shift-o). Insert one of these after the x, after the +, and after the 1. Another radical extender just after the 1, followed by a space and dx, produces

$$\int \sqrt[3]{2x+1}\ dx$$

You might want to try going further with this to get

$$\int \sqrt[3]{2x+1}\ dx\ = \tfrac{3}{8}\big(2x+1\big)^{4/3} + C$$

(The parentheses shown here are larger than the standard ones; type option-u then y, option-u then Y, or use the Character Palette.)

The next two pictures illustrate Leibniz-style derivative notation. The "dy/dx" expression in the first picture is obtained by typing shift-7 (or locating the $\frac{d}{d}$–operator with PopChar), then option-x followed by option-shift-y. (Notice that "lim" is in a non-italic font, as would be "sin", "cos", "ln", etc. This is important!) The super- and subscript Δ's and the subscript arrow can be found easily with the Character Palette.

$$\frac{dy}{dx} = \lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$$

You'll be amazed at how easy it is to produce this chain-rule expression:

$$\frac{dy}{dx} = \frac{\partial y}{\partial u}\frac{du}{dx} + \frac{\partial y}{\partial v}\frac{dv}{dx}$$

The "KaShowTech" Fonts

Each of the KahoeTech fonts has an "italic" version. Their purpose is to aid in the editting and fine-tuning process by revealing the hidden spaces and zero-width characters in a KahoeTech expression. Think of command-i as "get info" for KahoeTech.

Each italic font is basically the same as the corresponding KahoeTech font except that the width of each character is at least the width of the character's outline, and spaces—space, o, and option-space—have small sub-baseline indicators. For example, typing

x space option-shift-3 space + space 1

in KahoeTech Latin will produce

$$x^3 + 1$$

Highlighting this and pressing command-i reveals

$$x^3 + 1$$

The expression $\frac{\Delta y}{\Delta x}$ shown previously becomes

$$\frac{\Delta y}{\Delta x}$$

when viewed in italics. Below is the italic version of $\int \sqrt[3]{2x+1}\, dx$:

$$\int \sqrt[3]{2x+1}\, dx$$

The following table shows several other examples, and—just for fun—how each would look in Times.

KahoeTech Latin		Times
plain	*italic*	
$f^{(n)}$	$f^{(n)}$	f où ˜û
$x^{2/3}$	$x^{2/3}$	x € ¿ ‹
Q^{a-b}	Q^{a-b}	Q Å oo— oo1
$a^{3,k}_{1,b}$	$a^{3,k}_{1,b}$	ao¡‹≤¯o∫
$H^{m}_{\ell/2}$	$H^{m}_{\ell/2}$	H¬÷Â™
$\left\| X \right\|^2_{2,G}$	$\left\| X \right\|^2_{2,G}$	»»ooXoo»»o™€≤oí
$\sum_{i=n+j}^{\infty}$	$\sum_{i=n+j}^{\infty}$	Éîoú≠ ñ ò Δ
$\hat{x}''(t)$	$\hat{x}''(t)$	x^'oo'o(t)
$\sqrt[n]{x^k+y^\ell}$	$\sqrt[n]{x^k+y^\ell}$	˜Æx oØ+oØyo ÒoØ
$\widetilde{w}_{k^\circ}\,\bar{x}_\infty$	$\widetilde{w}_{k^\circ}\,\bar{x}_\infty$	w~°oÄoxÕõ

The next two examples are about as complicated as anything you should ever try. The first one involves a change in point size.

$$\sqrt[3]{1+\sqrt[5]{3}} \qquad {}^{3}\sqrt{\_1\_}+\sqrt[5]{\_3\_} \qquad \text{‹Æ 1 Ø+oØ fiÆØ3 Ø}$$

The next one involves two changes in point size.

$$\sqrt{2+\sqrt{2+\sqrt{2}}}$$

$$\sqrt{2+\sqrt{2+\sqrt{2}}}+\sqrt{2+\sqrt{2}}$$

$$\text{Æo2o+Ø ÆoØ2ooØ+Ø Ø ÆoØ2oØØ}$$

KahoeTech Greek

Very little needs to be said about KahoeTech Greek. It is basically the same as KahoeTech Latin, except it's based on the Greek alphabet. Whenever there is a Roman equivalent, that key is used. For instance, typing b gives you β. In other cases, the following more-or-less standard correspondences apply:

Greek:	χ	θ	ξ	ψ	ω
Roman:	c	q	x	y	w

The upper-case letters available as super/subscripts are $\Delta\Phi\Gamma\Lambda\Theta\Upsilon\Omega\Xi\Psi$. While these are in the same locations as the upper-case super/subscripts in KahoeTech Latin, there is no natural correspondence between the letters themselves. Just as with KahoeTech Latin, the italic version of the font exposes zero-width characters and narrow spaces.

The following are a few examples showing (essentially) identical strings in KahoeTech Latin and KahoeTech Greek.

Latin	Greek
$\frac{dy}{dx}=\frac{\partial y}{\partial u}\frac{du}{dx}+\frac{\partial y}{\partial z}\frac{dz}{dx}$	$\frac{d\psi}{d\xi}=\frac{\partial \psi}{\partial \upsilon}\frac{d\upsilon}{d\xi}+\frac{\partial \psi}{\partial \zeta}\frac{d\zeta}{d\xi}$
$\sqrt[n]{x^k+r^q}$	$\sqrt[\nu]{\xi^\kappa+\rho^\theta}$
$f(t)=at^2+bt+c$	$\varphi(\tau)=\alpha\tau^2+\beta\tau+\chi$
$G'(s^2)=2s\,g(s^2)$	$\Gamma'(\sigma^2)=2\sigma\,\gamma(\sigma^2)$

KahoeTech Symbols

This font contains many symbols including arrows, logic and set symbols, alternative upper-case Roman letters, wide accents, large grouping symbols, and a large integral sign.

$$\widetilde{xy} \rightleftharpoons u+v \qquad \mathcal{S} \Leftrightarrow \mathcal{A} \qquad \vec{x} \in \mathbb{R}^n$$

$$\therefore z \in \mathbb{R} \qquad h \downarrow 0 \qquad p \otimes q = \mp\phi$$

$$x \preccurlyeq y \;\Leftrightarrow\; y - x \in \mathcal{C}_+$$

$$\langle u, v \rangle \equiv u^T v = \sum u_i v_i \qquad \forall \epsilon > 0,\ \exists \varrho \in \mathcal{D} \subseteq \mathbb{R}$$

Many of the symbols come from keystrokes that make sense or can be easily remembered. These are indicated in the following table:

a	$\forall$	k	$\Bbbk$	v	$\vee$
shift-a	$\mathcal{A}$	shift-k	$\mathcal{K}$	shift-v	$\mathcal{V}$
option-shift-a	$\aleph$	l	$\in$	w	$\wp$
b	$\ddots$	shift-l	$\mathcal{L}$	shift-w	$\mathcal{W}$
shift-b	$\mathcal{B}$	m	$\ni$	x	$\exists$
c	$\mathcal{C}$	shift-m	$\mathcal{M}$	shift-x	$\mathcal{X}$
shift-c	$\mathbb{C}$	n	$/$	y	$\mathcal{Y}$
option-c	$\subseteq$	shift-n	$\mathbb{N}$	shift-y	$\mathcal{Y}$
option-shift-c	$\subset$	o	thin space	shift-z	$\mathbb{Z}$
d	$\mathcal{D}$	shift-o	$\mathcal{O}$	shift-6	$\wedge$
shift- d	$\mathcal{D}$	option-o	$\varnothing$	`	$\vec{}$
option-d	∂	p	ϖ	option-=	$\cong$
e	ϵ	shift-p	$\mathbb{P}$	option-9	$($
shift- e	$\mathcal{E}$	option-p	$\perp$	option-0	$)$
f	ϕ	option-shift-p	$\prod$	option-j	$\therefore$
shift-f	$\mathcal{F}$	shift-q	$\mathbb{Q}$	option-\	$\ddots$
g	$\digamma$	r	ϱ	option-shift-\	$\vdots$
shift-g	$\mathcal{G}$	shift- r	$\mathbb{R}$	option-;	$\cdots$
h	$\hbar$	option-shift-r	$\Re$	option-[	$\lfloor$
shift-h	$\mathcal{H}$	s	ς	option-shift-[	$\lceil$
option-h	$\mathfrak{H}$	shift-s	$\mathcal{S}$	option-]	$\rfloor$
i	$\mathbb{i}$	t	$\therefore$	option-shift-]	$\rceil$
shift-i	$\mathbb{I}$	shift-t	$\mathcal{T}$	option-shift-9	$\langle$
option-shift-i	$\Im$	u	$\cup$	option-shift-0	$\rangle$
j	$\mathbb{j}$	shift-u	$\mathcal{U}$		
shift-j	$\mathcal{J}$	option-u u	$\cap$		

Note that in place of the letter n, there is a negating slash:

$$\mathcal{A} \not\subset \mathcal{B} \;\not\Rightarrow\; x \notin \mathbb{R}.$$

More elaborate expressions can be constructed on multiple lines. In the following, the ∞ sign is a subscript on the first line and $n=1$ is a superscript on the third. Those were made with KahoeTech Latin.

$$\mathcal{Y} \triangleq \bigcup_{n=1}^{\infty} \mathcal{D}(\mathcal{L}_n)$$

The following is a two-line expression that uses a two-piece radical. The small 3 signifying the cube root is a KahoeTech Latin subscript. The fraction bar and the radical extender are made from the same symbol.

$$\sqrt[3]{\frac{x+3}{2x^2-1}}$$

Here's how that looks in "italics." (There's also an extra line in the middle.)

$$\sqrt[3]{\frac{x+3}{2x^2-1}}$$

Nice integrals are easy to construct. In the following, the upper limits of integration are KahoeTech Latin subscripts on the first line, and the lower limits of integration are KahoeTech Latin superscripts on the third line. You can fiddle with the placement of the limits by adjusting the line height and/or paragraph spacing.

$$\int_1^2 \int_0^y x^2 y \, dx \, dy$$

The top and bottom of those large slanted integral signs will be clipped by some applications, e.g., Microsoft Word. An alternative is the nonslanted *multiline* (3-piece) integral sign. Here the limits are again subscripts and superscripts from KahoeTech Latin.

$$\int_0^1 \sqrt{x} \, dx \qquad \int_a^b \frac{x \, dx}{x+1}$$

These matrices make use of multiline parentheses and square brackets.

$$\begin{pmatrix} 1 & 0 & 0 & \cdots \\ 0 & 1 & 0 & \\ \vdots & & \ddots & \\ 0 & & & 1 \end{pmatrix} \qquad \begin{bmatrix} 2 & 5 \\ 3 & 7 \end{bmatrix}^{-1}$$