

Daniel Flipo daniel.flipo@free.fr 4th May 2022

1 What is Erewhon-Math?

Erewhon-Math is an Utopia based Opentype mathematical font. The mathematical symbols and Greek letters are borrowed or derived from Michel Bovani's Fourier-GUT*enberg*, Latin letters and digits are borrowed from Michael Shape's Erewhon font.

It requires LuaTeX or XeTeX as engine and the unicode-math package¹.

It is meant to be used with Utopia based Opentype text fonts like Erewhon. For Fourier-GUT*enberg* users who want to switch to LuaLaTeX or XeLaTeX, the file fourier-otf.sty can be used as a replacement of fourier.sty.

Please note that the current version (0.53) is *experimental*, *do expect metrics and glyphs to change* until version 1.0 is reached. Comments, suggestions and bug reports are welcome!

2 Usage

2.1 Calling \setmathfont

A basic call for Erewhon-Math would be:

\usepackage{unicode-math}
\setmathfont{Erewhon-Math.otf} % Call by file name or
\setmathfont{Erewhon Math} % Call by font name

this loads Erewhon-Math as math font with the default options, see subsections 3.1 on page 3, 3.2 on page 4 and 3.3 on page 4 for customisation.

Please note that the three sets of text fonts have to be chosen separately, f.i.:

¹Please read the documentation unicode-math.pdf.

²Erewhon (with capital E) is fine with LuaTeX but would fail with XeTeX (erewhon. fontspec not found).

2.2 Calling fourier-otf.sty (recommended)

As an alternative to load Erewhon-Math you can type:

```
\usepackage[ options 3 ]{fourier-otf}
```

it loads unicode-math with the default options, sets Erewhon-Math as Math font and Erewhon Text fonts as Roman fonts (families *sf* and *tt* left unchanged) but does a bit more:

- 1. it loads real scripts. sty for better superscripts and footnote calls;
- 2. it loads fourier-orns.sty, providing many text ornaments;
- 3. it checks at \begin{document} if packages amssymb or latexsym are loaded and issues warnings in case they are;
- 4. it provides aliases for glyphs named differently in Unicode, so that latexsym or AMS names are also available;
- 5. it defines specific Math characters like \Bbbbackslash (\mathbb{N}), \varemptyset (\emptyset), \parallelslant (//), \shortparallelslant (//), etc.;
- 6. it reduces spacing in math mode: \thinmuskip, \medmuskip and \thickmuskip are reduced as in fourier.sty. The option loose disables these settings.

Apart from the loose option mentionned above, fourier-otf.sty provides two options no-text and Scale=<decimal> meant to be used to load the Erewhon-Math font together with roman text fonts other than Erewhon, while keeping the advantages 1. to 5. pointed in the preceding list, f.i. \usepackage[no-text, Scale=0.98]{fourier-otf}

Option no-text can also be useful if Erewhon is to be loaded with specific options, f.i. \usepackage[no-text]{fourier-otf} \setmainfont{erewhon}[RawFeature=+onum;+ss01]

3 What is provided?

Erewhon-Math provides all glyphs supplied by Fourier-GUT*enberg* plus all glyphs available in the amssymb and latexsym packages and many more. Therefore, these two packages *should not* be loaded as they might override Erewhon-Math glyphs.

Sans-serif, typewriter and fraktur styles are borrowed from Latin Modern fonts. See in section 3.6 on page 8 how to choose from other Math fonts for these styles.

A full list of available glyphs is shown in file unimath-erewhon.pdf.

³Possible *options* are loose, no-text, Scale= or any of the options described in sections 3.1, 3.2 and 3.3.

3.1 Upright or slanted?

Package unicode-math follows TeX conventions for Latin and Greek letters: in math mode, the default option (math-style=TeX) prints Latin letters a...z A...Z and lowercase greek letters $a...\omega$ slanted (italic) while uppercase greek letters AB $\Gamma...\Omega$ are printed upright. This can be changed by option math-style as shown in table 1.

Table 1: Effects of the math-style package option.

Package option	Latin	Greek
math-style=ISO	(a, z, B, X)	$(\alpha,\beta,\Gamma,\Xi)$
math-style=TeX	(a, z, B, X)	$(\alpha, \beta, \Gamma, \Xi)$
math-style=french	(a, z, B, X)	$(\alpha, \beta, \Gamma, \Xi)$
math-style=upright	(a, z, B, X)	$(\alpha, \beta, \Gamma, \Xi)$

Bold letters are printed upright except lowercase Greek letters which are slanted (the default option is bold-style=TeX). This can be changed by option bold-style as shown in table 2.

Table 2: Effects of the bold-style package option.

Package option	Latin	Greek
bold-style=ISO	(a, z, B, X)	$(\alpha, \beta, \Gamma, \Xi)$
bold-style=TeX	$(\mathbf{a}, \mathbf{z}, \mathbf{B}, \mathbf{X})$	$(\boldsymbol{\alpha}, \boldsymbol{\beta}, \Gamma, \Xi)$
bold-style=upright	$(\mathbf{a}, \mathbf{z}, \mathbf{B}, \mathbf{X})$	$(\alpha, \beta, \Gamma, \Xi)$

Other possible customisation: ∇ is printed upright and ∂ is printed slanted by default, but nabla=italic and partial=upright can change this.

All these options are offered by the unicode-math package but they can be added to the \setmathfont call⁴, for example:

\setmathfont{Erewhon Math}[math-style=french,partial=upright] will print for the code

$$\frac{\partial f}{\partial x} = \alpha \mathbf{V} + a \nabla \Gamma + \mathbf{\beta} \mathbf{M}$$

while the default settings would print

$$\frac{\partial f}{\partial x} = \alpha \mathbf{V} + a \nabla \Gamma + \boldsymbol{\beta} \mathbf{M}$$

Both shapes remain available anytime: π, π .

If your text editor is able to handle greek letters or math symbols, they can be entered in the code instead control sequences (i.e. α , β , Γ ,... for \alphalpha, \beta, \Gamma,...).

⁴IMHO it is easier to add *all options* to the \setmathfont command.

3.2 Character variants

Erewhon-Math provides fourteen "Character Variants" options, listed on table 3, to choose between different glyphs for Greek characters and some others. Alternative calligraphic capitals have been added for E, Q and T in version 0.50.

Table 3: Character variants.

	Default	Variant	Name
cv00	0	0	0
cv01	\hbar	\hbar	\hslash
cv02	Ø	Ø	\emptyset
cv03	ϵ	${\cal E}$	\epsilon
cv04	κ	κ	\kappa
cv05	π	ϖ	\pi
cv06	ϕ	φ	\phi
cv07	ho	ϱ	\rho
cv08	σ	ς	\sigma
cv09	heta	artheta	\theta
cv10	Θ	Θ	\Theta
cv11	д	∂	\partial
cv20	${\mathcal E}$	\mathscr{E}	\symcal{E}
cv21	2	Q	\symcal{Q}
cv22	${\mathscr T}$	€	\symcal{T}

For instance, to get \epsilon and \phi typeset as ε and φ instead of ε and φ , you can add option CharacterVariant={3,6} to the \setmathfont call:

\setmathfont{Erewhon Math}[CharacterVariant={3,6}]

This works for all shapes and weights of these characters: f.i. $\scriptstyle ... \$ symbf{\phi}\$ are output as ε , φ instead of ε , φ .

Similarly with math-style=french, \epsilon and \phi are output as ϵ and ϕ (upright). Please note that curly braces are mandatory whenever more than one "Character Variant" is selected.

Note about \hbar (v 0.43): unicode-math defines \hbar as \hslash (U+210F) while amsmath provides two different glyphs (italic h with horizontal or diagonal stroke). Erewhon Math now follows unicode-math; the italic h with horizontal stroke can be printed using \hslash or \hbar together with character variant cv01 or with \mithbar (replacement for AMS' command \hbar).

3.3 Stylistic sets

Erewhon-Math provides five "Stylistic Sets" options to choose between different glyphs for families of mathematical symbols.

StylisticSet=4, alias⁵ Style=leqslant, converts (large) inequalites into their slanted variants, see table 5a.

StylisticSet=5, alias Style=smaller, converts some symbols into their smaller variants, see table 5b.

Table 4: Stylistic Sets 4 and 5

(a) Style=leqslant (+ss04)

(b) Style=smaller (+ss05)

Command	Default	Variant
∖leq	<u>≤</u>	€
\geq	≥	≥
\nleq	≰	≰
\ngeq	≱	≱
\leqq	≦	€
\geqq	≧	\geqslant
\eqless	<	<
\eqgtr	>	≽
\lesseqgtr	≤	≶
\gtreqless	\geq	\geqslant
\lesseqqgtr	VIAVIAVIIV	/// //// ////
\gtreqqless		

() 3	•	,
Command	Default	Variant
\in	E	€
\ni	Э	Э
\mid		1
\nmid	ł	ł
\parallel		II
\nparallel	#	łł
\parallelslant	//	<i>II</i>
\nparallelslant	#	H

⁵These Style aliases are provided by fourier-otf.sty.

StylisticSet=6, alias Style=subsetneq, converts some inclusion symbols, see table 6a. StylisticSet=7, alias Style=parallelslant, converts "parallel" symbols into their slanted variants, see table 6b.

Table 5: Stylistic Sets 6 and 7

(a) Style=subsetneq (+ss06)		(b)Style=parallelslant (+ss07)			
Command	Default	Variant	Command	Default	Variant
\subsetneq	⊊	⊊	\parallel		
\supsetneq	⊋	⊋	\nparallel	#	H
\subsetneqq	⊊	≨	\shortparallel	II	//
\supsetneqq	⊋	⊋	\nshortparallel	łł	#

To enable Stylistic Sets 4, 6 and 7 for Erewhon-Math, you should enter

\setmathfont{Erewhon Math}[StylisticSet={4,6,7}] or \usepackage[Style={leqslant,subsetneq,parallelslant}]{fourier-otf}

then, \[x\leq y \quad A \subsetneq B\quad D \parallel D' \] will print as

$$x \leq y$$
 $A \subseteq B$ $D \parallel D'$

instead of

$$x \le y$$
 $A \subsetneq B$ $D \parallel D'$

StylisticSet=3, alias⁶ Style=upint, converts integrals signs into their upright variants, see table 6.

Table 6: Style=upint (+ss03)

Command	\int	\iint	\iiint	\iiiint	\oint	\oiint	\oiiint	
Default	\int	\iint	\iiint	\iiint	∮	∯	\oiint	∰
Upright	\int	\iint	\iiint	\iiint	\oint	\oiint	\oiint	\iint

Command	\intclockwise	\awint	\varointclockwise	\ointctrclockwise
Default	\int	\oint	∳	∳
Upright	\int	\int	\oint	\oint

3.4 Other font features

To get oldstyle numbers in Maths, the feature +onum is available:

\setmathfont{Erewhon Math}[Numbers=OldStyle] or \usepackage[Style={fulloldstyle]{fourier-otf}

0123456789, 0123456789

3.5 Standard LETEX math commands

All standard MT_EX math commands, all amssymb commands and all latexsym commands are supported by Erewhon-Math, for some of them loading fourier-otf.sty is required. Various wide acccents are also supported:

₩ \widehat and \widetilde

$$\hat{x}$$
 $\hat{x}\hat{x}$ \hat{x} $\hat{x$

$$\overline{x}$$
 \overline{xy} \overline{xyz} $\overline{A \cup B}$ $\overline{A \cup (B \cap C) \cup D}$ $\underline{m+n+p}$

\wideoverbar, \widecheck and \widebreve

$$\overline{x}$$
 \overline{xy} \overline{xyz} \check{x} \overline{xxxx} \overline{xxxxxx} \check{x} \overline{xxxx} \overline{xxxxxx}

⁶These Style aliases are provided by fourier-otf.sty.

$$\widehat{x}$$
 \widehat{xy} \widehat{xyz} $\stackrel{\circ}{\widehat{A \cup B}}$ $\widehat{A \cup (B \cap C) \cup D}$ $\stackrel{2}{\widehat{x + y}}$ $\widehat{a + b + \dots + z}$

$$\underbrace{x}$$
 \underbrace{xz} \underbrace{xyz} $\underbrace{x+z}$ $\underbrace{a+b+...+z}$

☞ \overbrace and \underbrace

$$\overrightarrow{a}$$
 \overrightarrow{ab} \overrightarrow{abc} \overrightarrow{abcd} \overrightarrow{abcde} $\overrightarrow{a+b+c}$ $\overrightarrow{a+b+...+z}$

$$\underline{a}$$
 \underline{ab} \underline{abc} \underline{abcd} \underline{abcde} $\underline{a+b+c}$ $\underline{a+b+...+z}$

◊ \overbracket and \underbracket

$$\overline{a}$$
 \overline{ab} \overline{abc} \overline{abcd} \overline{abcde} $\overline{a+b+c}$ $\overline{a+b+...+z}$

$$\underline{a}$$
 \underline{ab} \underline{abc} \underline{abcd} \underline{abcde} $\underline{a+b+c}$ $\underline{a+b+...+z}$

♥ \overrightarrow and \overleftarrow

$$\vec{v}$$
 \vec{M} $\vec{v}\vec{v}$ \vec{AB} \vec{ABC} \vec{ABCD} $\vec{ABCDEFGH}$.

$$\dot{\overline{v}} \quad \overleftarrow{M} \quad \overleftarrow{vv} \quad \overleftarrow{AB} \quad \overleftarrow{ABC} \quad \overleftarrow{ABCD} \quad \overleftarrow{ABCDEFGH}$$

Finally \widearc and \overrightarc (loading fourier-otf.sty is required)

$$\widehat{AMB}$$
 \widehat{AMB}

3.6 Mathematical alphabets

- All Latin and Greek characters are available in italic, upright, bold and bold italic via the \symit{}, \symbf{} and \symbfit{} commands.
- Calligraphic alphabet (\symscr or \symcal or \mathcal command), uppercase:

 ABCDEFGHIJKLMNOPQRITUVWXYI

 also in boldface (\symbfscr,\symbfcal or \mathbfcal command):

 ABCDEFGHIJKLMNOPQRITUVWXYI

Blackboard-bold alphabet (\symbb or \mathbb command), uppercase, lowercase and digits:

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789
```

Fraktur alphabet is borrowed from Latin Modern,

ABCDEFGHUNDFORSTURWXYJabcdefghijelmnopqrsturwryz

but this can overwritten, i.e.

ABCDEFGHTRLMNOPQRETUBWXY3abcdefghijfImnopqrstubwxy3

Sans serif alphabet is borrowed from Latin Modern,

ABCDEFGHIJKLMabcdefghijk NOPQRSTUVWXYZmnopqrstuvwxyz

but it can be borrowed from another Math font, i.e.

ABCDEFGHIJKLMabcdefghijklm NOPQRSTUVWXYZnopqrstuvwxyz

Typewriter alphabet is borrowed from Latin Modern,

ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz

but it can be borrowed from another Math font, i.e.

```
\setmathfont{STIXTwoMath-Regular.otf}[range=tt,Scale=MatchUppercase]
$\symtt{ABCDE...XYZ abcde...xyz}$
```

ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz

Like Latin Modern, Erewhon Math provides only four lowercase latin letters in script (or calligraphic) shape: e, q, ℓ, o (\mscre, \mscrg, \ell, \mscro).

All others (range "1D4B6 to "1D4CF) have to be borrowed from another Math font if needed, i.e.

```
\setmathfont{LibertinusMath-Regular.otf}% [range="1D4B6-"1D4CF, Scale=MatchLowercase]
```

3.7 Missing symbols

Erewhon-Math does not aim at being as complete as STIXTwoMath-Regular or Cambria, the current glyph coverage compares with TeXGyre Math fonts. In case some symbols do not show up in the output file, you will see warnings in the .log file, for instance:

Missing character: There is no \Rightarrow (U+2964) in font ErewhonMath

Borrowing them from a more complete font, say Asana-Math, is a possible workaround: \setmathfont{Asana-Math.otf}[range={"2964},Scale=1.02]

scaling is possible, multiple character ranges are separated with commas: \setmathfont{Asana-Math.otf}[range={"294A-"2951,"2964,"2ABB-"2ABE}]

Let's mention albatross, a useful tool to find out the list of fonts providing a given glyph: f.i. type in a terminal "albatross U+2964", see the manpage or albatross-manual.pdf.

3.8 Fourier ornaments

When loaded by \usepackage{fourier-otf}, Erewhon Math loads fourier-orns.sty which provides all logos and ornaments available in Fourier-GUT*enberg*.

four ier-orns.sty as of v2.x automatically fetches its glyphs in a specific Opentype font with LuaTeX or XeTeX engines and from a Type 1 font otherwise (pdfTeX).

- Two "starred" bullets: \starredbullet +, \decosix ♦.
- Decos and logos: \warning ∧, \noway ♠, \caution ゑ, \bomb Ă, \decode ※, \decotwo ¾, \decothreeleft ♠, \decothreeright ♠, \decofourleft ♠, \decofourright ♠, \floweroneleft ⑤, \floweroneright ⑥, \lefthand ⑤, \righthand ⑥, \textxswup ※, \textxswdown ※.
- Smileys: \grimace (?), \textthing \T.
- Leaves: \aldineleft ⑤, \aldineright ⑥, \aldine ⑥, \aldinesmall ₺,
 \leafleft ←, \leafright ←, \leafNW ♠, \leafSE ♠, \leafSW ∅.
- Pilcrows: \oldpilcrowone (, \oldpilcrowtwo (, \oldpilcrowthree (, \oldpilcrowfour (, \oldpilcrowfive () aaaa, \oldpilcrowsix () aaaaaaaaaaaaa.

All these logos and ornaments are also available as described in the fournier-orns documentation: for instance, you could type {\FourierOrns E 2 F} to get ② & ③.

Finally, some symbols are also provided in math mode, with other names:

- $\$ \$\forbidden\$(\(\bigstyrean\), \$\beware\$(\(\bar{\Lambda}\)), \$\boom\$(\(\bar{\Bo}\)),
- \$\thething\$ (\textstyle{\textsty}
- \$\xswordsup\$(\infty) and \$\xswordsdown\$(\infty) may be used as tags for a debatted statement, or for anything else.

4 Acknowledgements

All glyphs in Erewhon-Math are borrowed or derived either from Erewhon fonts or Fourier-GUT *enberg* package. Many thanks to Michael Sharpe and Michel Bovani for providing these.

I am grateful to George Williams and his co-workers for providing and maintaining Font-Forge and to Ulrik Vieth for his illuminating paper published in TUGboat 2009 Volume 30 about Open Type Math.

Thanks to Oliver Natt for providing valuable feedback!

