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#### 1 What is Erewhon-Math?

Erewhon-Math is an Utopia based OpenType maths font. The maths 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 package<sup>1</sup>.

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 (0.66) 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 maths font<sup>2</sup> with the default options, see subsections 3.1 on page 3, 3.2 on page 4 and 3.3 on page 5 for customisation.

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

 $<sup>^1\</sup>mbox{Please}$  read the documentation unicode-math.pdf.

<sup>&</sup>lt;sup>2</sup>Both calls work equally well with LuaTeX; with XeTeX a call by font name will fail unless the font is declared as a *system font*.

### 2.2 Calling fourier-otf.sty (recommended)

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

```
\usepackage[ options 4 ]{fourier-otf}
```

it loads unicode-math with the default options, sets Erewhon-Math as maths 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 maths characters like \Bbbbackslash ( $\mathbb{N}$ ), \varemptyset ( $\emptyset$ ), \parallelslant ( $\mathbb{N}$ ), \shortparallelslant ( $\mathbb{N}$ ), etc.;
- 6. it reduces spacing in maths mode: \thinmuskip, \medmuskip and \thickmuskip are reduced as in fourier.sty. The option loose disables these settings.

Apart from the loose option mentioned 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}

Please note that the fonts loaded by fourier-otf.sty are about 2% larger than those loaded by fourier.sty: the Erewhon text fonts are based on Utopia reduced à 94%, while the fourier fonts are based on Utopia reduced à 92%. Option Scale=0.98 can be used to mimic the output produced by the fourier.sty package.

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]

<sup>&</sup>lt;sup>3</sup>Erewhon (with capital E) is fine with LuaTeX but would fail with XeTeX (erewhon.fontspec not found).

<sup>&</sup>lt;sup>4</sup>Possible options are loose, no-text, Scale= or any of the options described in sections 3.1 to 3.4.

# 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 9 how to choose from other maths fonts for these styles.

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

## 3.1 Upright or slanted?

Package unicode-math follows  $T_EX$  conventions for Latin and Greek letters: in maths 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 of	Table 1:	Effects of	fthe	math-	stvle	package	option.
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	_	
Package option	Latin	Greek
math-style=ISO	(a,z,B,X)	$\overline{(\alpha,\beta,\Gamma,\Xi)}$
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:  $\nabla$  is printed upright and  $\partial$  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 call<sup>5</sup>, for example:

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

<sup>&</sup>lt;sup>5</sup>IMHO it is easier to add *all options* to the \setmathfont command.

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

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:  $\pi, \pi$ .

If your text editor is able to handle Greek letters or maths symbols, they can be entered in the code instead control sequences (i.e.  $\alpha$ ,  $\beta$ ,  $\Gamma$ ,... for \alpha, \beta, \Gamma,...).

#### 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	$\epsilon$	${\cal E}$	\epsilon
cv04	κ	κ	\kappa
cv05	$\pi$	$\varpi$	\pi
cv06	$\phi$	$\varphi$	\phi
cv07	ho	$\varrho$	\rho
cv08	$\sigma$	ς	\sigma
cv09	heta	artheta	\theta
cv10	Θ	Θ	<b>\Theta</b>
cv11	д	$\partial$	\partial
cv20	${\mathcal E}$	$\mathscr E$	\symcal{E}
cv21	$\mathscr{Q}$	Q	\symcal{Q}
cv22	${\mathscr T}$	$\mathscr{E}$	\symcal{T}

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

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

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

Similarly with math-style=french, \epsilon and \phi are output as  $\epsilon$  and  $\phi$  (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 maths symbols.

StylisticSet=4, alias<sup>6</sup> Style=leqslant, converts (large) inequalities 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=legslant (+ss04)

(b) Style=smaller (+ss05)

Command	Default	Variant
∖leq	<b>≤</b>	€
\geq	≥	≥
\nleq	≰	≰
\ngeq	≱	≱
<b>\leqq</b>	≦	€
\geqq	≧	$\geqslant$
\eqless	<	<
\eqgtr	>	≽
\lesseqgtr	<b>\leq</b>	$\leq$
\gtreqless	≥	/// //// //// ////
\lesseqqgtr	⋚	
\gtreqqless	N VIAVIAVIA	

Command	Default	Variant
\in	E	€
\ni	Э	Э
\mid		1
\nmid	ł	ł
\parallel		II
\nparallel	#	łł
\parallelslant	//	11
\nparallelslant	H	łł

StylisticSet=6, alias Style=subsetneq, converts some inclusion symbols, see table 6a on the next page.

StylisticSet=7, alias Style=parallelslant, converts "parallel" symbols into their slanted variants, see table 6b on the following page.

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

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

<sup>&</sup>lt;sup>6</sup>These Style aliases are provided by fourier-otf.sty.

Table 5: Stylistic Sets 6 and 7

(a) Style=subsetneq (+ss06)

(b) Style=parallelslant (+ss07)

Command	Default	Variant
\subsetneq	⊊	⊊
\supsetneq	⊋	⊋
\subsetneqq	⊊	≨
\supsetneqq	⊋	⊋

Command	Default	Variant
\parallel		//
\nparallel	#	H
\shortparallel	II	//
\nshortparallel	łł	H

then,  $[x\leq y \quad A \quad D \quad D' \quad ]$  will print as

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

instead of

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

StylisticSet=3, alias<sup>7</sup> 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	$\int$	$\iint$	$\iiint$	$\iiint$	$\oint$	∯	∯	∰
Upright	$\int$	$\iint$	$\iiint$	$\iiint$	$\oint$	$\oiint$	$\oiint$	∰

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

#### 3.4 Other font features

### 3.4.1 Oldstyle numbers

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

0123456789, 0123456789

<sup>&</sup>lt;sup>7</sup>These Style aliases are provided by fourier-otf.sty.

#### 3.4.2 Delimiters' size

When switching from Type 1 to OpenType, Adobe has significantly increased<sup>8</sup> the sizes of Utopia's delimiters '()', '[]' and '{}'. Erewhon-Math has been built from Fourier (Utopia's Type 1 type faces<sup>9</sup>), while the Erewhon text fonts have been built from the OpenType version; the difference was visible on examples like (P(n)) which has been typeset as (P(n)) by versions up to 0.53.

This glitch is now fixed, you get now (P(n)), [P[n]],  $\{P\{n\}\}$ . An option Style=smalldelim (+ss09), which can be passed either to the fourier-off package or to the \setmathfont command, has been added in version 0.54 for backward compatibility: it reverts to the former behaviour.

#### 3.5 Standard LaTeX math commands

All standard LaTeX maths 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 accents are also supported:

\wideoverbar and \mathunderbar<sup>10</sup>

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

\widehat and \widetilde

\widecheck and \widebreve

$$\check{x}$$
  $\widetilde{xxxx}$   $\widetilde{xxxxxx}$   $\check{x}$   $\widetilde{xxxx}$   $\widetilde{xxxxxx}$ 

\overparen and \underparen

$$\widehat{x} \quad \widehat{xy} \quad \widehat{xyz} \quad \stackrel{\circ}{\widehat{A \cup B}} \quad \stackrel{\circ}{\widehat{A \cup (B \cap C) \cup D}} \quad \stackrel{2}{\underbrace{x + y}} \quad \stackrel{26}{\underbrace{a + b + \dots + z}}$$

$$\underbrace{x} \quad \underbrace{xz} \quad \underbrace{xyz} \quad \underbrace{x + z}_{2} \quad \underbrace{a + b + \dots + z}_{26}$$

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

<sup>&</sup>lt;sup>8</sup>Actually +21% both in height and thickness!

<sup>&</sup>lt;sup>9</sup>Scaled at 94% instead of 92% to match Erewhon text fonts.

<sup>&</sup>lt;sup>10</sup>\overline and \underline are not font related, they are based on \rule.

◊ \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

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

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

◊ \overrightharpoon and \overleftharpoon

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

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

\underrightarrow and \underleftarrow

\underrightharpoon and \underleftharpoondown

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

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

All the extensible arrows provided by the mathtools package are available in the Erewhon-Math font (loading fourier-otf.sty is required), f.i.:

$$X \stackrel{above}{\longleftrightarrow} Y \stackrel{above}{\longleftrightarrow} Z \stackrel{above}{\longleftrightarrow} W$$

## 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:

  ABCDEFGHIJKLMNOPQRSTUVWXYI

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

  ABCDEFGHIJKLMNOPQRSTUVWXYI
- Blackboard-bold alphabet (\symbb or \mathbb command):

  ABCDEFGHIJKLMNOPQRSTUVWXYZ

  abcdefghijklmnopqrstuvwxyz 0123456789
- Fraktur alphabet is borrowed from Latin Modern,

  ABCDEFGHUNDFORSTURWXYJabcdefghijelmnopqrsturwryz

  but this can overwritten, i.e.

\setmathfont{Asana-Math.otf}[range=frak,Scale=MatchUppercase]
\$\symfrak{ABCDEFGHIJKL...XYZ abcdefghijkl...xyz}\$

ABCDEFG533RLMNDPQRETUBWX93abcdefghijfImnopqrstuvwxn3

Sans serif alphabet is borrowed from Latin Modern,

ABCDEFGHIJKLMabcdefghijk NOPQRSTUVWXYZmnopqrstuvwxyz

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

ABCDEFGHIJKLMabcdefghijklm NOPQRSTUVWXYZnopgrstuvwxyz

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,  $\ell$ , o (\mscre, \mscrg, \ell, \mscro).

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

```
\setmathfont{LibertinusMath-Regular.otf}%

[range="1D4B6-"1D4CF, Scale=MatchLowercase]
```

#### 3.7 Bold variant

In case short maths formulas have to be printed in section titles, a *limited* bold variant has been added in version 0.54. Example of usage:

```
\setmathfont{Erewhon-Math-Bold.otf}[version=bold, options]
\section{\mathversion{bold} Einstein's equation $E=mc^2$}
  It is also possible to use the \boldmath command:
\setmathfont{Erewhon-Math-Regular.otf}[BoldFont=Erewhon-Math-Bold.otf]
\section{\boldmath Einstein's equation $E=mc^2$}
```

### 3.8 Missing symbols

Erewhon-Math does not aim at being as complete as STIXTwoMath-Regular or Cambria, the current glyph coverage compares with TeXGyre maths 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:  $\label{lem:more} $$ \operatorname{Scale}_1.02] $$ 

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.

#### 3.9 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*.

fourier-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 ♠, \bomb Ă, \decode ¾, \decotwo ⅔, \decothreeleft ♠, \decothreeright ♠, \decofourleft ♠, \floweroneright ♠, \flowe

\lefthand ☞, \righthand ☜, \textxswup 🗶, \textxswdown 💥.

- Smileys: \grimace ⋈, \textthing Ţ.
- Leaves: \aldineleft ♥, \aldineright ♥, \aldine ¥, \aldinesmall \*, \leafleft ←, \leafright ←, \leafNW ♠, \leafSE ♠, \leafSW Ø.
- Pilcrows: \oldpilcrowone (, \oldpilcrowtwo (, \oldpilcrowthree (, \oldpilcrowfour (, \oldpilcrowfive () aaaa, \oldpilcrowsix () aaaaaaaaaaaa.

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 \$\&\mathbb{E}\$.

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

- \$\forbidden\$( $\triangle$ ), \$\beware\$( $\dot{\wedge}$ \), \$\boom\$( $\ddot{\bullet}$ ),
- $\$  \$\thething\$ ( $\$ ) is a QED symbol for a false proof. Of course, you don't need it!
- \$\xswordsup\$(\times) and \$\xswordsdown\$(\times) may be used as tags for a debated 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 Michael Bovani for providing these.

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