Erewhon-Math

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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` package[1].

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 (0.47) 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 the following page, 3.2 on page 3 and 3.3 on page 4 for customisation.

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

```
\setmainfont{Erewhon}                                % rm
\setsansfont{Cabin}[Scale=MatchLowercase]            % sf
\setmonofont{Inconsolatazi4}[Scale=MatchLowercase] % tt
```

otherwise you would get Latin Modern for text fonts.

[1] Please read the documentation `unicode-math.pdf`.

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

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

`\usepackage[` *options* [2] `]{fourier-otf}`

it also loads `unicode-math` with the default options and and sets `Fourier Math` as Math font but does a bit more:

1. it loads `fourier-orns.sty`, providing many text ornaments;
2. it checks at `\begin{document}` if packages `amssymb` or `latexsym` are loaded and issues warnings in case they are;
3. it provides aliases for glyphs named differently in Unicode, so that `latexsymb` or AMS names are also available;
4. it defines specific Math characters like `\Bbbbackslash` (⧵), `\varemptyset` (∅), `\parallelslant` (⫽), `\shortparallelslant` (⫻), etc.;
5. 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 textfonts other than Erewhon, while keeping the advantages 2. to 5. pointed in the preceeding list, f.i. `\usepackage[no-text,Scale=0.98]{fourier-otf.sty}`

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 3.5 on page 7 how to choose from other Math 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 TEX conventions for Latin and Greek letters: in math mode, the default option (`math-style=TeX`) prints Latin letters $a\ldots z$ $A\ldots Z$ and lowercase greek letters $\alpha\ldots\omega$ slanted (italic) while uppercase greek letters $AB\Gamma\ldots\Omega$ are printed upright. This can be changed by option `math-style` as shown in table 1 on the following page.

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 on the next page.

[2] Possible *options* are `loose`, `no-text`, `Scale=` or any of the options described below for `\setmathfont`.

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`	$(a, z, \mathrm{B}, \mathrm{X})$	$(\alpha, \beta, \Gamma, \Xi)$
`math-style=upright`	$(\mathrm{a}, \mathrm{z}, \mathrm{B}, \mathrm{X})$	$(\alpha, \beta, \Gamma, \Xi)$

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

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

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` call[3], for example:

```
\setmathfont{Erewhon Math}[math-style=french,partial=upright]
```

will print for the code

```
\[ \frac{\partial f}{\partial x} = \alpha \symbf{V} + a\nabla\Gamma
                                 + \symbf{\beta}\symbf{M} \]
```

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

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: `$\uppi, \itpi$` prints 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 `\alpha`, `\beta`, `\Gamma`,…).

3.2 Character variants

Erewhon-Math provides eleven "Character Variants" options to choose between different glyphs for Greek characters and some others, see table 3 on the following page for the full list.

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:

[3] IMHO it is easier to add *all options* to the `\setmathfont` command.

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

This works for all shapes and weights of these characters: `$\symit{\epsilon}$`, `$\symup{\epsilon}$`, `$\symbf{\epsilon}$`, `$\symbfit{\epsilon}$` are output as ϵ, $\mathrm{\epsilon}$, $\boldsymbol{\epsilon}$, $\boldsymbol{\epsilon}$ instead of ϵ, $\mathrm{\epsilon}$, $\boldsymbol{\epsilon}$, $\boldsymbol{\epsilon}$.

The same is true for `\phi` of course. Please note that curly braces are mandatory whenever more than one "Character Variant" is selected.

Table 3: Character variants.

	Default	Variant	Name
cv00	0	$\mathbb{0}$	0
cv01	$\hbar$	$\hbar$	\hslash
cv02	$\varnothing$	$\emptyset$	\emptyset
cv03	ϵ	ε	\epsilon
cv04	$\varkappa$	κ	\kappa
cv05	π	ϖ	\pi
cv06	ϕ	φ	\phi
cv07	ρ	ϱ	\rho
cv08	σ	ς	\sigma
cv09	θ	ϑ	\theta
cv10	Θ	$\varTheta$	\Theta

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). `kpfonts-otf` 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 four "Stylistic Sets" options to choose between different glyphs for families of mathematical symbols.

`StylisticSet=4`, alias[4] `Style=leqslant`, converts (large) inequalites into their slanted variants as shown by table 5a on the next page.

`StylisticSet=5`, alias `Style=smaller`, converts some symbols into their smaller variants as shown by table 5b on the following page.

`StylisticSet=6`, alias `Style=subsetneq`, converts some inclusion symbols as shown by table 6a on the next page.

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

[4] These `Style` aliases are provided by `fourier-otf.sty`.

Table 4: Stylistic Sets 4 and 5

(a) `Style=leqslant (+ss04)`

Command	Default	Variant
`\leq`	$\leq$	$\leqslant$
`\geq`	$\geq$	$\geqslant$
`\nleq`	$\not\leq$	$\not\leqslant$
`\ngeq`	$\not\geq$	$\not\geqslant$
`\leqq`	$\leqq$	$\leqslant$
`\geqq`	$\geqq$	$\geqslant$
`\eqless`	$\eqslantless$	$\leqslant$
`\eqgtr`	$\eqslantgtr$	$\geqslant$
`\lesseqgtr`	$\lesseqgtr$	$\lesseqgtr$
`\gtreqless`	$\gtreqless$	$\gtreqless$
`\lesseqqgtr`	$\lesseqqgtr$	$\lesseqqgtr$
`\gtreqqless`	$\gtreqqless$	$\gtreqqless$

(b) `Style=smaller (+ss05)`

Command	Default	Variant
`\in`	$\in$	$\in$
`\ni`	$\ni$	$\ni$
`\mid`	$\mid$	$\mid$
`\nmid`	$\nmid$	$\nmid$
`\parallel`	$\parallel$	$\parallel$
`\nparallel`	$\nparallel$	$\nparallel$
`\parallelslant`	$\parallel$	$\parallel$
`\nparallelslant`	$\nparallel$	$\nparallel$

Table 5: Stylistic Sets 6 and 7

(a) `Style=subsetneq (+ss06)`

Command	Default	Variant
`\subsetneq`	$\subsetneq$	$\subsetneq$
`\supsetneq`	$\supsetneq$	$\supsetneq$
`\subsetneqq`	$\subsetneqq$	$\subsetneqq$
`\supsetneqq`	$\supsetneqq$	$\supsetneqq$

(b) `Style=parallelslant (+ss07)`

Command	Default	Variant
`\parallel`	$\parallel$	$\parallel$
`\nparallel`	$\nparallel$	$\nparallel$
`\shortparallel`	$\shortparallel$	$\shortparallel$
`\nshortparallel`	$\nshortparallel$	$\nshortparallel$

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

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

instead of

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

3.4 Standard LaTeX math commands

All standard LaTeX 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`

$$\widehat{x}\ \widehat{xx}\ \widehat{xxx}\ \widehat{xxxx}\ \widehat{xxxxx}\ \widehat{xxxxxx}\ \widehat{xxxxxxx}\ \widetilde{x}\ \widetilde{xx}\ \widetilde{xxx}\ \widetilde{xxxx}\ \widetilde{xxxxx}\ \widetilde{xxxxxx}\ \widetilde{xxxxxxx}$$

☞ `\overline` and `\underline`

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

☞ `\wideoverbar`, `\widecheck` and `\widebreve`

$$\overline{x}\quad\overline{xy}\quad\overline{xyz}\quad\check{x}\quad\widecheck{xxxx}\quad\widecheck{xxxxxx}\quad\breve{x}\quad\widebreve{xxxx}\quad\widebreve{xxxxxx}$$

☞ `\overparen` and `\underparen`

$$\overparen{x}\quad\overparen{xy}\quad\overparen{xyz}\quad\overparen{\mathring{A\cup B}}\quad\overparen{A\cup(B\cap C)\cup D}^{\circ}\quad\overparen{x+y}^{2}\quad\overparen{a+b+\ldots+z}^{26}$$

$$\underparen{x}\quad\underparen{xz}\quad\underparen{xyz}\quad\underparen{x+z}_{2}\quad\underparen{a+b+\ldots+z}_{26}$$

☞ `\overbrace` and `\underbrace`

$$\overbrace{a}\quad\overbrace{ab}\quad\overbrace{abc}\quad\overbrace{abcd}\quad\overbrace{abcde}\quad\overbrace{a+b+c}^{3}\quad\overbrace{a+b+\ldots+z}^{26}$$

$$\underbrace{a}\quad\underbrace{ab}\quad\underbrace{abc}\quad\underbrace{abcd}\quad\underbrace{abcde}\quad\underbrace{a+b+c}_{3}\quad\underbrace{a+b+\ldots+z}_{26}$$

☞ `\overbracket` and `\underbracket`

$$\overbracket{a}\quad\overbracket{ab}\quad\overbracket{abc}\quad\overbracket{abcd}\quad\overbracket{abcde}\quad\overbracket{a+b+c}^{3}\quad\overbracket{a+b+\ldots+z}^{26}$$

$$\underbracket{a}\quad\underbracket{ab}\quad\underbracket{abc}\quad\underbracket{abcd}\quad\underbracket{abcde}\quad\underbracket{a+b+c}_{3}\quad\underbracket{a+b+\ldots+z}_{26}$$

☞ `\overrightarrow` and `\overleftarrow`

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

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

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

$$\overparen{AMB}\quad\overparen{AMB}\vec{}$$

3.5 Mathematical alphabets

- ☞ All Latin and Greek characters are available in italic, upright, bold and bold italic via the `\symit{}`, `\symup{}`, `\symbf{}` and `\symbfit{}` commands.
- ☞ Calligraphic alphabet (`\symscr` or `\symcal` or `\mathcal` command), uppercase:
  $\mathcal{ABCDEFGHIJKLMNOPQRSTUVWXYZ}$
- ☞ Blackboard-bold alphabet (`\symbb` or `\mathbb` command), uppercase, lowercase and digits:
  $\mathbb{ABCDEFGHIJKLMNOPQRSTUVWXYZ}$
  $\mathbb{abcdefghijklmnopqrstuvwxyz\quad 0123456789}$
- ☞ Fraktur alphabet is borrowed from Latin Modern,
  $\mathfrak{ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz}$
  but this can overwritten, i.e.

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

  $\mathfrak{ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz}$
- ☞ Sans serif alphabet is borrowed from Latin Modern,
  ABCDEFGHIJKL$\mathsf{Mabcdefghijk\quad NOPQRSTUVWXYZmnopqrstuvwxyz}$
  but it can be borrowed from another Math font, i.e.

```
\setmathfont{STIXTwoMath-Regular.otf}[range={sfup,sfit},
                                Scale=MatchUppercase]
$\symsfup{ABCD...klm}\quad\symsfit{NOPQ...xyz}$
```

  ABCDEFGHIJKL$\mathsf{Mabcdefghijklm\quad NOPQRSTUVWXYZnopqrstuvwxyz}$
- ☞ 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, g, 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]
```

3.6 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 ⇒ (U+2964) in font ErewhonMath`

Borrowing them from a more complete font, say `STIXTwoMath-Regular`, is a possible workaround: `\setmathfont{STIXTwoMath-Regular.otf}[range={"2964},Scale=1.02]` scaling is possible, multiple character ranges are separated with commas:
`\setmathfont{STIXTwoMath-Regular.otf}[range={"294A-"2951,"2964,"2ABB-"2ABE}]`

3.7 Fourier ornaments

All logos and ornaments provided by Fourier-GUT*enberg* (`fourier-orns.sty`) are available with Erewhon-Math when loaded by `\usepackage{fourier-otf}`.

`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).

- ☞ `\textpertenthousand` ‰, *‱*, **‱**, ***‱***.
- ☞ A variant of the euro symbol: `\eurologo` €, *€*, **€**, ***€***.
- ☞ Two "starred" bullets: `\starredbullet` ✦, `\decosix` ✧.
- ☞ Decos and logos: `\warning` ⚠, `\noway` ⛔, `\caution` ⚠, `\bomb` 💣, `\decoone`, `\decotwo`, `\decothreeleft`, `\decothreeright`, `\decofourleft`, `\decofourright`, `\floweroneleft`, `\floweroneright`, `\lefthand` ☞, `\righthand` ☜, `\textxswup` ⤫, `\textxswdown` ⤬.
- ☞ Smileys: `\grimace` ☹, `\textthing` 🝢.
- ☞ Leaves: `\aldineleft`, `\aldineright`, `\aldine`, `\aldinesmall`, `\leafleft`, `\leafright`, `\leafNE`, `\leafNW`, `\leafSE`, `\leafSW`.
- ☞ Pilcrows: `\oldpilcrowone` ¶, `\oldpilcrowtwo` ¶, `\oldpilcrowthree` ¶, `\oldpilcrowfour` ¶, `\oldpilcrowfive` ¶ aaaa, `\oldpilcrowsix` ¶ aaaaaaaaaa.

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 ⚠.

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

- ☞ `$\forbidden$` (⛔), `$\beware$` (⚠), `$\boom$` (💣),
- ☞ `$\thething$` (🝢) is a *QED symbol* for a false proof. Of course, you don't need it!
- ☞ `$\xswordsup$` (⤫) and `$\xswordsdown$` (⤬) may be used as tags for a debatted statement, or for anything else.

4 Acknowledgements

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