Euler Math font, OTF version

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1 What is Euler Math?

Euler Math is a fork of the Euler project initiated by Khaled Hosny in 2009 and abandoned in 2016[1]. The original font name 'Neo Euler', has been changed to 'Euler Math', the file name is now `Euler-Math.otf`.

`Euler-Math.otf` is an OpenType version of Hermann Zapf's Euler maths font, as the original font it contains three alphabets EulerRoman, $\mathcal{SCRIPT}$ and $\mathfrak{EulerFraktur}$ (none of them being suitable for typesetting text) and has some specificities:

- ☞ it is an *upright* maths font, Latin and Greek letters are *not available* in italic or bold italic shape (only upright and bold) ;
- ☞ integral symbols are upright too;
- ☞ all inequalities symbols are *slanted*, so `\leq` and `geq` are printed as $\leqslant$ and $\geqslant$ (same as `\leqslant` and `\geqslant`).

Euler Math requires LuaTeX or XeTeX as engine and the `unicode-math` package[2].

Coverage: currently, all Plain, LaTeX and AMS maths symbols are provided; sans-serif (Latin, Greek, digits) and typewriter (Latin, digits) defaults are included.

Please note that the current version (0.75) is *experimental, do expect metrics and glyphs to change* until version 1.0 is reached. Comments, suggestions and bug reports are welcome!

[1] See https://github.com/aliftype/euler-otf

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

2 Usage

2.1 Calling `\setmathfont`

A basic call for Euler Math would be:

```
\usepackage[math-style=upright]{unicode-math}
\setmathfont{Euler-Math.otf} % Call by file name or
\setmathfont{Euler Math}     % Call by font name or
```

this loads Euler Math as maths font[3] with the default options, see subsections 3.1, 3.2 and 3.3 for customisation.

Please note that the three sets of text fonts have to be chosen separately.

2.2 Calling `euler-math.sty` (recommended)

As an alternative to load Euler Math you can type:

```
\usepackage{euler-math}
```

```
\usepackage[ options [4] ]{euler-math}
```

it loads `unicode-math` with the `math-style=upright` option and sets Euler Math as maths font and does a bit more:

1. it checks at `\begin{document}` if packages `amssymb` or `latexsym` are loaded and issues warnings in case they are;
2. it provides aliases for glyphs named differently in Unicode, so that `latexsym` or AMS names are also available;
3. it defines some specific maths characters `\varemptyset` ($\varnothing$), etc.

The `euler-math.sty` package is meant to replace the `eulervm.sty` package for users switching from pdfLaTeX to LuaLaTeX or XeLaTeX. It does not interfere with text fonts which have to be chosen separately.

3 What is provided?

Euler Math provides all glyphs available in the `amssymb` and `latexsym` packages and many more, f.i. lots of extensible accents and arrows. Therefore, the latter two packages *should not* be loaded as they might override Euler Math glyphs.

As mentioned above, there is neither italic nor bold italic shapes; for user's convenience, these slots are filled with their upright analogs. Sans-serif (Latin, Greek,

[3] 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*.

[4] Possible *options* are `Scale=` or any of the options described in sections 3.1, 3.2 and 3.3.

digits) and typewriter (Latin, digits) alphabets, Fraktur and Blackboard Bold styles are included.

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

3.1 Character variants

Euler Math provides fourteen "Character Variants" options, listed on table 1, to choose between different glyphs for Greek characters and some others.

Table 1: Character variants.

	Default	Variant	Name
cv01	ℏ	ℏ	\hslash
cv02	∅	∅	\emptyset
cv03	ϵ	ε	\epsilon
cv04	κ	ϰ	\kappa
cv05	π	ϖ	\pi
cv06	ϕ	φ	\phi
cv09	θ	ϑ	\theta
cv10	Θ	Θ	\Theta
cv11	Φ	Φ	\Phi

For instance, to get `\epsilon` and `\phi` typeset as ε and φ instead of ϵ and ϕ (with matching bold variants ε and $\boldsymbol{\varphi}$), you can add option `CharacterVariant={3,6}` to the `\setmathfont` call:

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

Please note that curly braces are mandatory whenever more than one "Character Variant" is selected.

Breaking change in version 0.75: in the previous versions of `euler-math` the glyphs provided for `\Theta` and `\Phi` were different from those included in v3.0 of the AMS Euler fonts. The former versions are kept back as `\varTheta` and `\varPhi`[5] and also available through Character Variants 10 and 11 respectively, see Table 1.

Note about `\hbar`: `unicode-math` defines `\hbar` as `\hslash` (U+210F) while `amsmath` provides two different glyphs (ħ with horizontal or diagonal stroke).
`euler-math` follows `unicode-math`; the ħ with horizontal stroke can be printed using `\hslash` or `\hbar` together with character variant `cv01` or with `\muphbar` (replacement for AMS' command `\hbar`).

3.2 Stylistic sets

Euler Math provides two "Stylistic Sets" options to choose between different glyphs for families of maths symbols.

[5] The latter command, not part of `unicode-math`, is defined in `euler-math.sty` only.

StylisticSet=5, alias[6] **Style=smaller**, converts some symbols into their smaller variants, see table 2a.

StylisticSet=6, alias **Style=subsetneq**, converts some inclusion symbols, see table 2b.

Table 2: Stylistic Sets 5 and 6

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

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

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

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

To enable Stylistic Sets 5 and 6 for Euler Math, you should enter

```
\setmathfont{Euler-Math.otf}[StylisticSet={5,6}]  or
\usepackage[Style={smaller,subsetneq}]{Euler-Math.otf}
```

then, `\[A \subsetneq B\quad x \in E \quad D \parallel D' \]` will print as

$$A \subsetneq B \quad x \in E \quad D \parallel D'$$

instead of

$$A \subsetneq B \quad x \in E \quad D \parallel D'$$

3.3 Other font features

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

```
\setmathfont{Euler-Math.otf}[Numbers=OldStyle]  or
\usepackage[Style={fulloldstyle}]{euler-math}
```

$0123456789, \mathbf{0123456789}$

3.4 Standard LaTeX math commands

All standard LaTeX maths commands, all amssymb commands and all latexsym commands are supported by Euler Math, for some of them loading `euler-math.sty` is required.

Various wide accents are also supported:

[6] These `Style` aliases are provided by `euler-math.sty`.

☞ \wideoverbar and \mathunderbar[7]

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

☞ \widehat and \widetilde

$$\hat{x} \; \widehat{xx} \; \widehat{xxx} \; \widehat{xxxx} \; \widehat{xxxxx} \; \widehat{xxxxxx} \; \tilde{x} \; \widetilde{xx} \; \widetilde{xxx} \; \widetilde{xxxx} \; \widetilde{xxxxx} \; \widetilde{xxxxxx}$$

☞ \widecheck and \widebreve

$$\breve{x} \quad \widecheck{xxxx} \quad \widecheck{xxxxxx} \quad \breve{x} \quad \widebreve{xxxx} \quad \widebreve{xxxxxx}$$

☞ \overparen and \underparen

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

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

☞ \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, \overleftarrow and \overleftrightarrow

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

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

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

☞ \overrightharpoon and \overleftharpoon

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

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

[7] \overline and \underline are not font related, they are based on \rule.

☞ `\underrightarrow`, `\underleftarrow` and `\underleftrightarrow`

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

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

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

☞ `\underrightharpoondown` and `\underleftharpoondown`

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

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

☞ Finally `\widearc` and `\overrightarc` (loading `euler-math.sty` is required)

$$\widearc{AMB}\quad \overrightarc{AMB}$$

All extensible arrows provided by the `mathtools` package are available in the Euler Math font (loading `euler-math.sty` is required), f.i.:

$$X \xLeftrightarrow{\text{above}} Y \xhookrightarrow[\text{under}]{} Z \xmapsto{\text{above}} W$$

A wide range of extensible vertical delimiters is provided:

$$\left/ \begin{pmatrix} a_1\\ a_2\\ a_3 \end{pmatrix} \begin{bmatrix} a_1\\ a_2\\ a_3 \end{bmatrix} \begin{Bmatrix} a_1\\ a_2\\ a_3 \end{Bmatrix} \begin{vmatrix} a_1\\ a_2\\ a_3 \end{vmatrix} \begin{Vmatrix} a_1\\ a_2\\ a_3 \end{Vmatrix} \left\vvvert \begin{matrix} a_1\\ a_2\\ a_3 \end{matrix} \right\vvvert \left\lceil \begin{matrix} a_1\\ a_2\\ a_3 \end{matrix} \right\rceil \left\lfloor \begin{matrix} a_1\\ a_2\\ a_3 \end{matrix} \right\rfloor \left\llbracket \begin{matrix} a_1\\ a_2\\ a_3 \end{matrix} \right\rrbracket \left\langle \begin{matrix} a_1\\ a_2\\ a_3 \end{matrix} \right\rangle \left\langle\!\!\left\langle \begin{matrix} a_1\\ a_2\\ a_3 \end{matrix} \right\rangle\!\!\right\rangle \right\backslash$$

3.5 Mathematical alphabets

☞ All Latin and Greek characters are available in upright and bold via the `\symup{}` and `\symbf{}` commands.

☞ Calligraphic alphabet (`\symscr` or `\symcal` command), uppercase only:
$\mathscr{ABCDEFGHIJKLMNOPQRSTUVWXYZ}$
also in boldface (`\symbfscr`,`\symbfcal` or `\mathbfcal` command):
$\boldsymbol{\mathscr{ABCDEFGHIJKLMNOPQRSTUVWXYZ}}$

☞ Blackboard-bold alphabet (`\symbb` command), uppercase, lowercase and digits:

$\mathbb{ABCDEFGHIJKLMNOPQRSTUVWXYZ}$

$\mathbb{abcdefghijklmnopqrstuvwxyz}\quad \mathbb{0123456789}$

☞ Fraktur alphabet medium and bold (`\symfrak`, or `\symbffrak` commands):

$\mathfrak{ABCDEFGHIJKLMNOPQRSTUVWXYZ}\quad \mathfrak{abcdefghijklmnopqrstuvwxyz}$
$\boldsymbol{\mathfrak{ABCDEFGHIJKLMNOPQRSTUVWXYZ}}$
$\boldsymbol{\mathfrak{abcdefghijklmnopqrstuvwxyz}}$

☞ Sans-serif (Latin and Greek) and Typewriter (Latin) alphabets (commands `\symsf{}`, `\symbfsf{}`, `\symtt{}`):

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 0123456789

ΑΒΓΔΕΖΗΘΙΚΛΜΝΞΟΠΡΣΤΥΦΧΨΩ
αβγδεζηθικλμνξοπρσςτυφχψω

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 0123456789

3.6 Missing symbols

Euler 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 Euler Math`

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 -t U+2964`", see the manpage or `albatross-manual.pdf`.

4 Acknowledgements

Khaled Hosni achieved most of the portage of Hermann Zapf's Euler font to Unicode between 2009 and 2016. After Hermann's death in 2015, he decided to stop the project but his `euler.otf` font, although not available on CTAN, continued to be used, see https://tex.stackexchange.com/questions/425098/. I offered Khaled my help to finalise the font, we agreed I would try to complete the font and maintain it on my own.