

Euler Math font, OTF version

Daniel Flipo
daniel.flipo@free.fr

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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 2016¹. 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, $\mathcal{SCRIP}T$ and 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 package².

Coverage: currently, all Plain, LaTeX and AMS maths symbols are provided; sans serif and typewriter families of Latin and Greek letters and digits are not included.

Please note that the current version (0.31) is *experimental, do expect metrics and glyphs to change* until version 1.0 is reached. Comments, suggestions and bug reports are welcome!

¹See <https://github.com/aliftype/euler-otf>

²Please 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 font³ 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 but 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 `\varempyset` (\emptyset), 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.

These two packages *should not* be loaded as they might override Euler-Math glyphs.

As mentioned above, there is neither italic nor bold italic shapes. Furthermore, the font has currently no sans-serif, no typewriter family included. Fraktur and Blackboard

³Both calls work equally well with LuaTeX; with XeTeX a call by font name will fail unless the font is declared as a *system font*.

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

Bold styles are included. See in section 3.5 on page 6 how to choose from other maths fonts if sans-serif or typewriter glyphs are needed.

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	<code>\hslash</code>
cv02	∅	∅	<code>\emptyset</code>
cv03	ε	ε	<code>\epsilon</code>
cv04	κ	κ	<code>\kappa</code>
cv05	π	ω	<code>\pi</code>
cv06	φ	φ	<code>\phi</code>
cv09	θ	θ	<code>\theta</code>
cv10	Θ	Θ	<code>\Theta</code>

For instance, to get `\epsilon` and `\phi` typeset as ε and φ instead of ε and φ (with matching bold variants ε and φ), 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.

Note about `\hbar`: `unicode-math` defines `\hbar` as `\hslash` (U+210F) while `amsmath` provides two different glyphs (h with horizontal or diagonal stroke).

`euler-math` follows `unicode-math`; the h 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.

`StylisticSet=5`, alias `Style=smaller`, converts some symbols into their smaller variants, see table 3a on the following page.

`StylisticSet=6`, alias `Style=subsetneq`, converts some inclusion symbols, see table 3b on the next page.

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

Table 2: Stylistic Sets 5 and 6

(a) Style=smaller (+ss05)			(b) Style=subsetneq (+ss06)		
Command	Default	Variant	Command	Default	Variant
<code>\in</code>	\in	\in	<code>\subsetneq</code>	\subsetneq	\subsetneq
<code>\ni</code>	\ni	\ni	<code>\supsetneq</code>	\supsetneq	\supsetneq
<code>\mid</code>	$ $	$ $	<code>\subsetneqq</code>	\subsetneqq	\subsetneqq
<code>\nmid</code>	\nmid	\nmid	<code>\supsetneqq</code>	\supsetneqq	\supsetneqq
<code>\parallel</code>	\parallel	\parallel			
<code>\nparallel</code>	\nparallel	\nparallel			

`\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}`

`o123456789`, `o123456789`

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:

`\wideoverbar` and `\mathunderbar`⁵

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

`\widehat` and `\widetilde`

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

⁵`\overline` and `\underline` are not font related, they are based on `\rule`.

☞ `\widecheck` and `\widebreve`

$$\check{x} \quad \check{xxxx} \quad \check{xxxxxx} \quad \breve{x} \quad \breve{xxx} \quad \breve{xxxxx}$$

☞ `\overparen` and `\underparen`

$$\overparen{x} \quad \overparen{xy} \quad \overparen{xyz} \quad \overparen{A \cup B} \quad \overparen{A \cup (B \cap C) \cup D} \quad \overparen{x+y} \quad \overparen{a+b+\dots+z}$$

$$\underparen{x} \quad \underparen{xz} \quad \underparen{xyz} \quad \underparen{x+z} \quad \underparen{a+b+\dots+z}$$

☞ `\overbrace` and `\underbrace`

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

$$\underbrace{a} \quad \underbrace{ab} \quad \underbrace{abc} \quad \underbrace{abcd} \quad \underbrace{abcde} \quad \underbrace{a+b+c}_3 \quad \underbrace{a+b+\dots+z}_{26}$$

☞ `\overbracket` and `\underbracket`

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

$$\underbracket{a} \quad \underbracket{ab} \quad \underbracket{abc} \quad \underbracket{abcd} \quad \underbracket{abcde} \quad \underbracket{a+b+c}_3 \quad \underbracket{a+b+\dots+z}_{26}$$

☞ `\overrightarrow`, `\overleftarrow` and `\overleftrightarrow`

$$\overrightarrow{v} \quad \overrightarrow{M} \quad \overrightarrow{vw} \quad \overrightarrow{AB} \quad \overrightarrow{ABC} \quad \overrightarrow{ABCD} \quad \overrightarrow{ABCDEFGH}$$

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

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

☞ `\overrightarrow` and `\overleftarrow`

$$\overrightarrow{v} \quad \overrightarrow{M} \quad \overrightarrow{vw} \quad \overrightarrow{AB} \quad \overrightarrow{ABC} \quad \overrightarrow{ABCD} \quad \overrightarrow{ABCDEFGH}$$

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

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

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

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

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

☞ `\underrightarrow` and `\underleftarrow`

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

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

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

$$\widearc{AMB} \quad \overrightarrow{AMB}$$

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` or `\mathcal` command), uppercase:

ABCDEFGHIJKLMNOPQRSTUVWXYZ

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

ABCDEFGHIJKLMNOPQRSTUVWXYZ

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

ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyz 0123456789

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

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz

abcdefghijklmnopqrstuvwxyz

☞ Sans serif and Typewriter alphabets have to be imported from another math font, f.i. STIXTwoMath:

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

ABCDEFGHIJKLMabcdefghijklm

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

ABCDEFGHIJKLMNPOQRSTUVWXYZabcdefghijklmnopqrstuvwxyz

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 \Rightarrow (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 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.

