The HEP-MATH-FONT package*

Extended Greek and sans-serif math

Jan Hajer†

2023/07/01

Abstract

The HEP-MATH-FONT package adjust the math fonts to be italic sans-serif if the document is sans-serif. Additionally Greek letters are redefined to be always italic and upright in math and text mode, respectively. Some math font macros are adjusted to give more consistently the naively expected results.

The package is loaded using `\usepackage{hep-math-font}`.

If the document `\familydefault` font is switched to the sansserif `\sfdefault` font the math font is adjusted accordingly using fonts compatible to latin modern (LM) and computer modern (CM).

`warning` In order to be able to easily switch large chucks of math from serif to sans-serif documents the meaning of `\mathrm` and `\mathsf` is adjusted in this case so that the first generates upright sans-serif math and the second serif math. This is is neither the literal meaning of the macros nor the best behaviour if a single large document is written in sans-serif. However, it simplifies working in an environment where one copies pieces of math between serif and sans-serif documents e.g. publications vs. talks and funding applications.

Using the FIXMATH [1] and TEXTALPHA [2] packages Greek letter are adjusted so that they are always italic and upright in math and text mode, respectively. Greek letters can be written by using their unicode characters.

`symbols` The `symbols=`⟨*family*⟩ class option sets the family of the symbol fonts. `symbols=ams` loads the two $\mathcal{AMS}$ fonts [3] and the BM bold fonts. The default `symbols=true` replaces additionally the blackboard font with the DSFONT [4]. `symbols=minion` switches the symbol fonts to the Adobe MinionPro companion font from the MNSYMBOL package [5]. `symbols=false` deactivates loading any additional symbol fonts, effectively restricting the package to only switch the math font according to the sans-serif property of the main text.

1 Macros

`\text` `\mathrm` The `\mathrm{`⟨*math*⟩`}` macro and the `\text{`⟨*text*⟩`}` macro from AMSTEXT [6] are adjusted to produce upright Greek letters, i.e. (AbΓδ**AbΓδ**), by adjusting the code from the ALPHABETA [7] package.

`\mathbf` Bold math, via `\mathbf` is improved with the BM package [8], i.e. ($Ab\Gamma\delta$***AbΓδ***). Macros switching to `bfseries` such as `\section{`⟨*text*⟩`}` are ensured to also typeset math in bold.

`\mathsf` The math sans-serif alphabet is redefined to be italic sans-serif if the main text is serif and italic

*This document corresponds to HEP-MATH-FONT v1.2.

†jan.hajer@tecnico.ulisboa.pt

serif if the main text is sans-serif, i.e. ($Ab\Gamma\delta$ **$Ab\Gamma\delta$**). Ensuring that the distinction between these fonts is also kept if the (sans-)serif option of the document is switched.

`\mathscr` The `\mathcal` font i.e. ($\mathcal{ABCD}$) is accompanied by the `\mathscr` font i.e. ($\mathscr{ABCD}$).

`\mathbb` The `\mathbb` font is improved by the DOUBLESTROKE package [4] and adjusted depending on the (sans-)serif option of the document i.e. ($\mathbb{Alh1}$).

`\mathtt` The `\mathtt` macro switches to LM typewriter font i.e. (`AbΓAbΓ`).

`\mathfrak` Finally, the `\mathfrak` font is also available i.e. ($\mathfrak{Aa}\mathfrak{Bb}12$).

Details about the font handling in TEX can be found in reference [9].

2 Math alphabet allocation

Of the 16 available math alphabets, TEX loads four by default

0) **OT1** Text (latin, upper case greek, numerals, text symbols)

   The text font 0) of CM is **cmr10** `\OT1/cmr/m/n/10`, which is replaced by LM to be **rm-lmr10** `\OT1/lmr/m/n/10`, the `sansserif` option uses **rm-lmss10** `\OT1/lmss/m/n/10`.

1) **OML** Math Italic (latin, greek, numerals, text symbols)

   The italic math font 1) of CM is **cmmi10** `\OML/cmm/m/it/10`, and is replaced by LM to be **lmmi10** `\OML/lmm/m/it/10`, the `sansserif` options uses **cmssmi10** `\OML/cmssrm/m/it/10` from the SANSMATHFONTS package [10].

2) **OMS** Symbol (`\mathcal`, operators)

   The symbol font 2) of CM is **cmsy10** `\OMS/cmsy/m/n/10`, and is replaced by LM to be **lmsy10** `\OMS/lmsy/m/n/10`, the `sansserif` options uses **cmsssy10** `\OMS/cmsssy/m/n/10` from the SANSMATHFONTS package [10].

3) **OMX** Math Extension (big operators, delimiters)

   The extension font 3) of CM is **cmex10** `\OMX/cmex/m/n/5`, and is replaced by the EXSCALE package [11] to be **cmex10** `\OMX/cmex/m/n/10`, the `sansserif` option loads **cmssex10** `\OMX/cmssex/m/n/10`.

The AMSSYMB (AMSFONTS) packages [12] load two more symbol fonts

4) **msam10** `\U/msa/m/n/10` AMS symbol font A (special math operators)

5) **msbm10** `\U/msb/m/n/10` AMS symbol font B (`\mathbb`, negated operators)

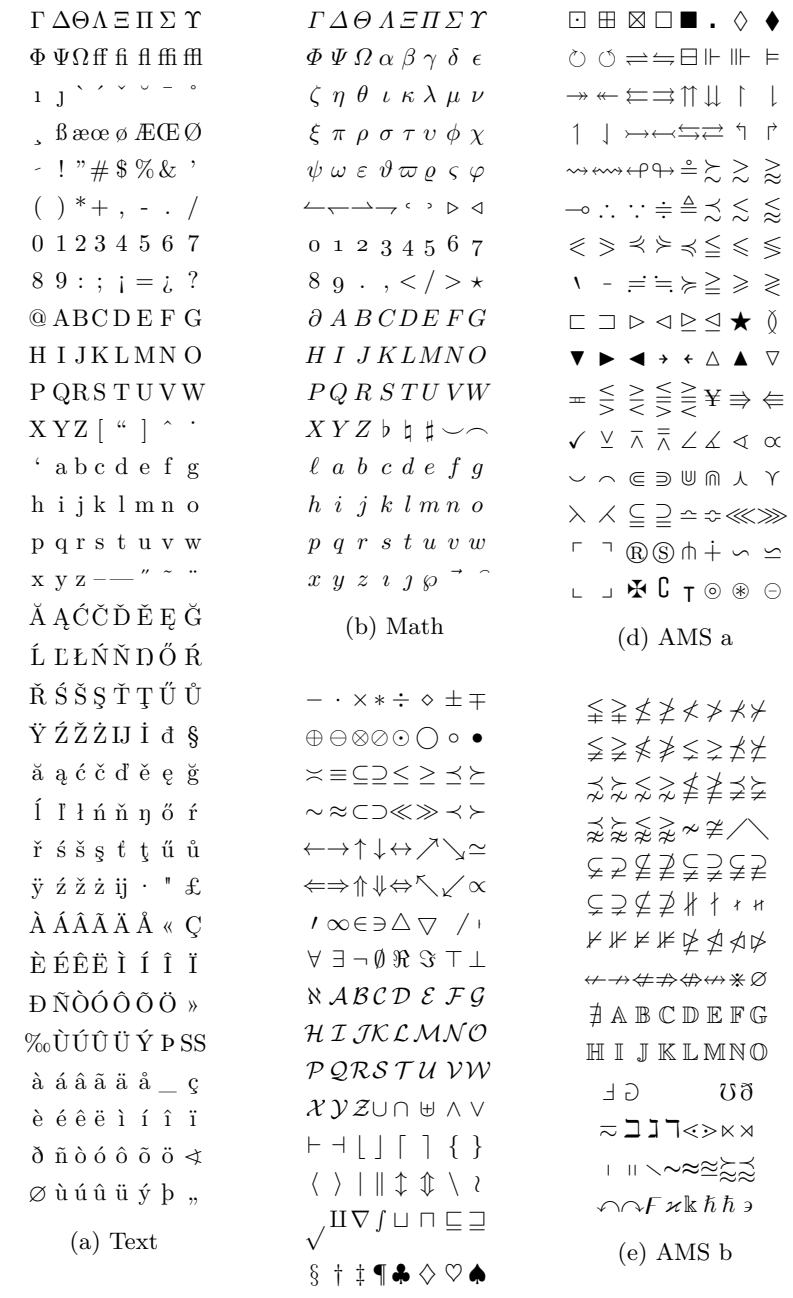
The `sansserif` option replaces them with **ssmsam10** `\U/ssmsa/m/n/10` and **ssmsbm10** `\U/ssmsb/m/n/10` from the SANSMATHFONTS package [10], respectively.

The BM package [8] loads the bold version for the fonts 0) to 2).

Other math alphabets are only loaded on demand, e.g. `\mathsf` uses a sans-serif font and `\mathbf` without the BM package uses a bold font. The `\mathscr` macro uses the script font from the MATHRSFS package [13]

9) **rsfs10** `\U/rsfs/m/n/10` Math script font (capital letters)

The `\mathbb` macro loads the double stroke font from the DSFONT package [4], this can be prevented with the `symbols=ams` option.



(a) Text

(b) Math

(c) Symbol

(d) AMS a

(e) AMS b

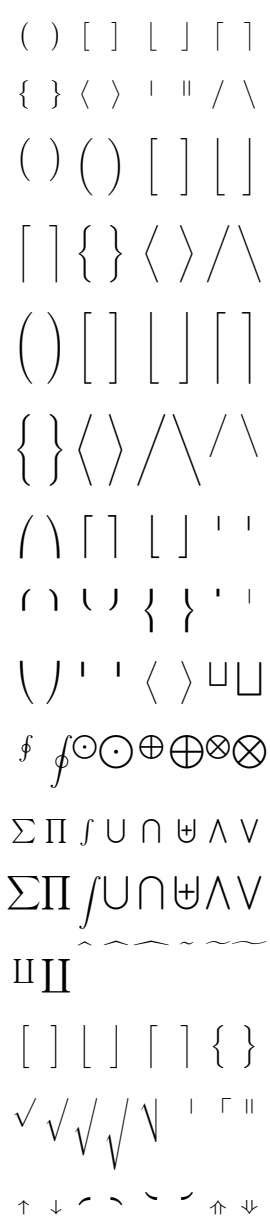
(f) Euler fraktur

(g) Euler caligraphy

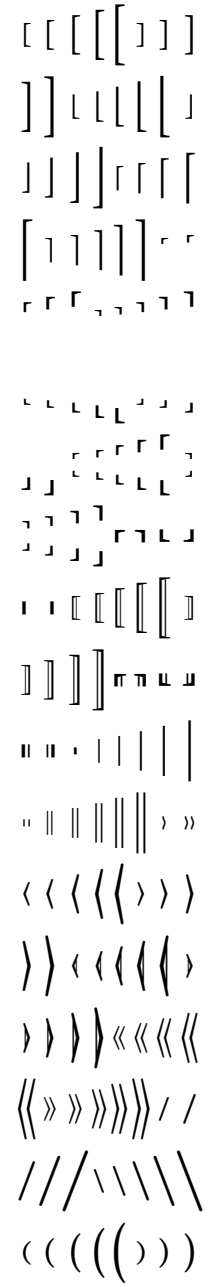
(h) Minion caligraphy

(i) Doublestroke

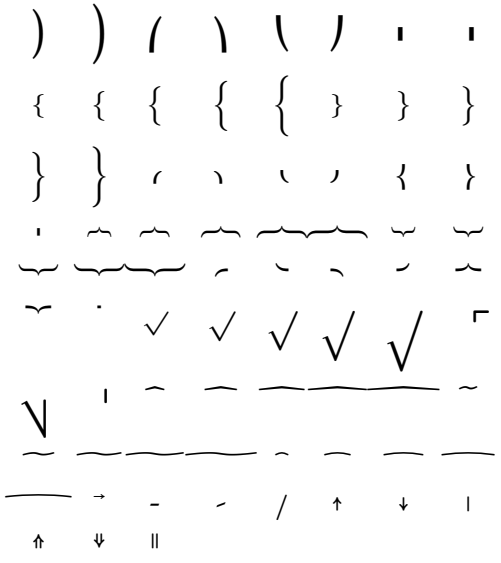
Figure 1: Basic math fonts



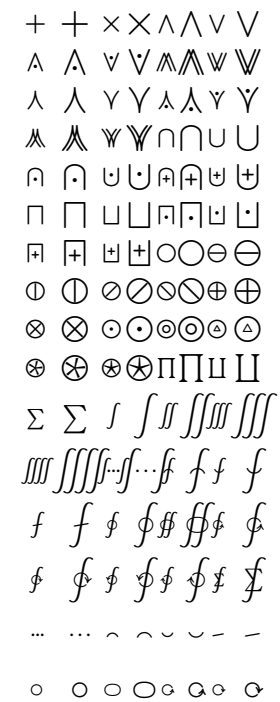
(a) Computer modern



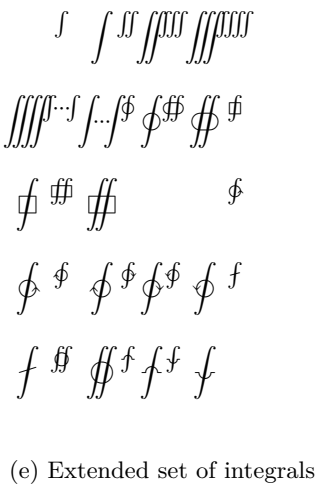
(b) Mn Symbol E 1



(c) Mn Symbol E 2

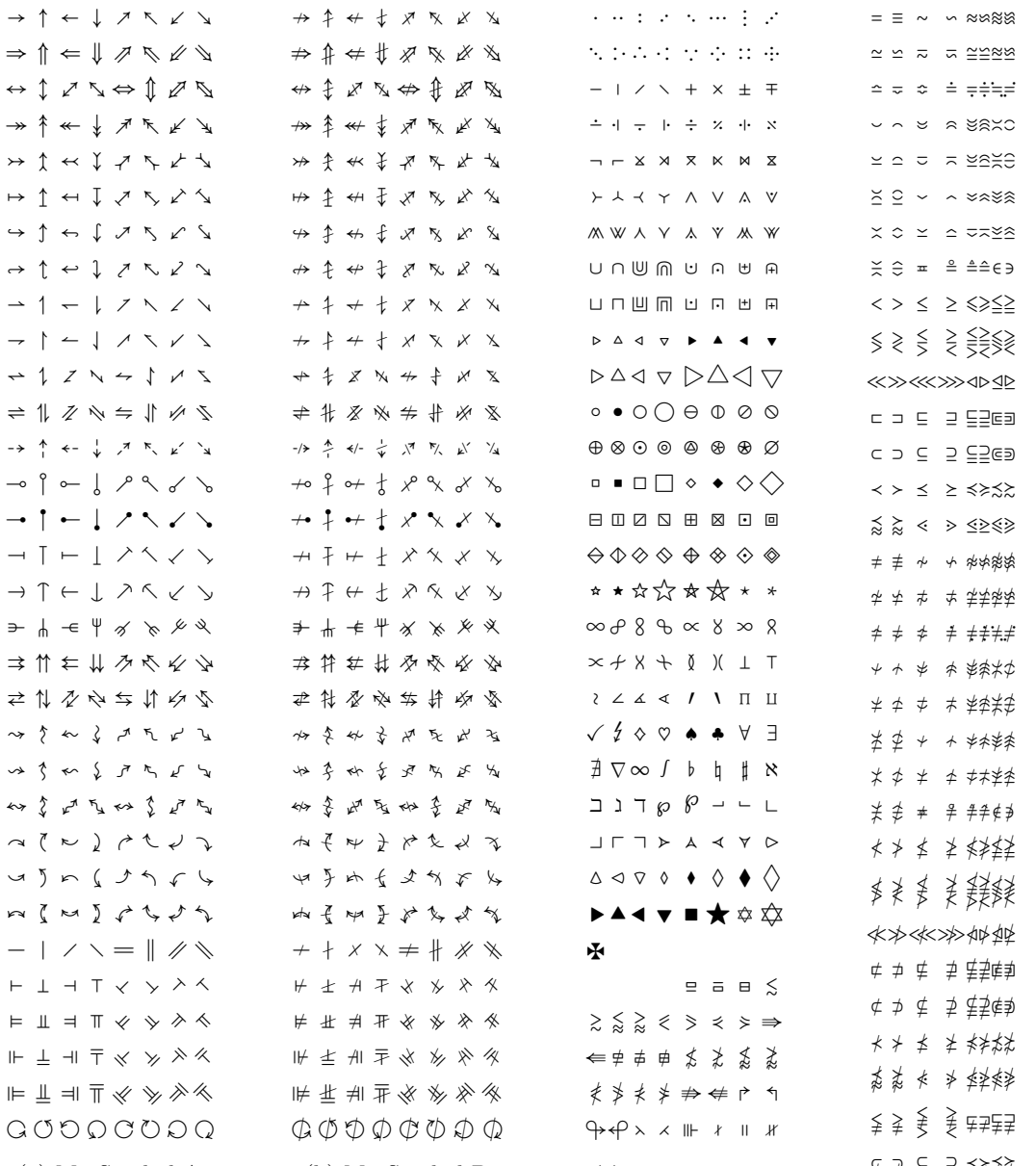


(d) Mn Symbols F



(e) Extended set of integrals

Figure 2: Math extension fonts



(a) Mn Symbol A (b) Mn Symbol B (c) Mn Symbol C (d) Mn Symbol D

Figure 3: Minion symbol fonts

10) **dsrom10** `\U/dsrom/m/n/10` Double stroke font

The `\mathfrak` macro loads the fractur font from the AMSSYMB package [12]

11) **eufm10** `\U/euf/m/n/10` Math fraktur (Basic Latin)

The HEP-MATH-FONT package uses nine of the available 16 math alphabets. This number can be reduced by three using `\newcommand{\bmmax}{0}` from the BM package [8] and brought down to the default of four with the option `symbols=false`.

The `symbols=minion` options replaces the fonts 2) to 5) with corresponding fonts from the MnSymbol package [5]. Additionally, two more symbol alphabets are allocated, the BM package [8] loads one more font and now `\mathcal` triggers the use of one additional alphabet. Hence, the minion option uses three to four more math alphabets than a usual setup.

References

[1] W. Schmidt. 'The `fixmath` package for LaTeX 2ε: Make maths comply with ISO 31-0:1992 to ISO 31-13:1992' (2000). CTAN: `fixmath`.

[2] G. Milde. 'The `textalpha` package: LICR macros and encoding definition files for Greek' (2010). CTAN: `greek-fontenc`.

[3] *American Mathematical Society.* 'The `amsfonts` package: TeX fonts from the American Mathematical Society' (1995). CTAN: `amsfonts`. URL: `ams.org/tex/amsfonts`.

[4] O. Kummer. 'The `doublestroke` font: Typeset mathematical double stroke symbols' (1995). CTAN: `doublestroke`.

[5] A. Blumensath. 'The `MnSymbol` package: Mathematical symbol font for Adobe MinionPro' (2005). CTAN: `MnSymbol`.

[6] *LaTeX Team.* 'The `amstext` package: Typeset text fragments in mathematics' (1995). CTAN: `amstext`. URL: `ams.org/tex/amslatex`.

[7] G. Milde. 'The `alphabeta` package: LICR macros and encoding definition files for Greek' (2013). CTAN: `greek-fontenc`.

[8] *LaTeX Team.* 'The `bm` package: Access bold symbols in maths mode' (1993). CTAN: `bm`.

[9] *LaTeX Team.* 'LaTeX 2ε font selection: Docmentation of LaTeX font commands' (1995). CTAN: `fntguide`.

[10] A. Barton. 'The `sansmathfonts` package: Correct placement of accents in sans-serif maths' (2013). CTAN: `sansmathfonts`.

[11] F. Mittelbach and R. Schöpf. 'The `exscale` package: Implements scaling of the "cmex" fonts' (1993). CTAN: `exscale`.

[12] *American Mathematical Society.* 'The `amssymb` package' (1995). CTAN: `amsfonts`.

[13] J. Knappen. 'The `mathrsfs` package: Support for using RSFS fonts in maths' (1995). CTAN: `mathrsfs`.