The mathalpha, AKA mathalfa package

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The math alphabets normally addressed via the macros `\mathcal`, `\mathbb`, `\mathfrak` and `\mathscr` are in a number of cases not well-adapted to the LaTeX math font structure. Some suffer from one or more of the following defects:

- font sizes are locked into a size sequence that was appropriate for metafont–generated rather than scalable fonts;
- there is no option in the loading package to enable scaling;
- the font metrics are designed for text rather than math mode, leading to awkward spacing, subscript placement and accent placement when used for the latter;
- the means of selecting a set of math alphabets varies from package to package.

The goal of this package is to provide remedies for the above, where possible. This means, in effect, providing virtual fonts with my personal effort at correcting the metric issues, rewriting the font-loading macros usually found in a .sty and/or .fd files to admit a scale factor in all cases, and providing a .sty file which is extensible and from which any such math alphabet may be specified using a standard recipe.

For example, the following fonts are potentially suitable as targets for `\mathcal` or `\mathscr` and are either included as part of TeXLive, as free downloads from CTAN or other free sources, or from commercial sites.

```
cm % Computer Modern Math Italic (cmsy)
euler % euscript
rsfs % Ralph Smith Formal Script---heavily sloped
rsfso % based on rsfs, much less sloped
lucida % From Lucida New Math (commercial)
mathpi % Adobe Mathematical Pi or clones thereof (commercial)
mma % Mathematica fonts
pxtx % pxfonts/txfonts
mt % Mathtime (commercial)
mtc % Mathtime Curly (commercial)
zapfc % Adobe Zapf Chancery (URW clone is part of TeXLive)
esstix % ESSTIX-thirteen
boondox % calligraphic alphabet derived from STIX1 fonts
boondoxo % based on boondox, but less oblique
dutchcal % regular and bold weights derived from ESSTIX13
pxtx % from pxfonts and txfonts
bickham % from commercial Bickham Script
```

```
bickhams % using semibold for Latex regular
stix % from STIX
txupr % upright calligraphic based on txfonts
boondoxupr % upright calligraphic based on STIX script
kp % regular and bold weights from kpfonts---script only
stixplain % STIX1 calligraphic
stixfancy % STIX1 script
stixtwoplain % STIX2 calligraphic
stixtwofancy % STIX2 script
```

In all that follows, you may use the package names mathalpha and mathalfa interchangeably. Once you have installed the support packages for these fonts and the mathalpha package, you may select a particular calligraphic font for `\mathcal` using something like

```
\usepackage[cal=rsfso,calscaled=.96]{mathalpha}
```

which loads rsfso at 96% of natural size as the math calligraphic alphabet. You may at the same time select the output for `\mathbb`, `\mathfrak`, `\mathbfrak` (since the Mathematica fonts have a bold version of bb) and `\mathscr` with

```
\usepackage[cal=mathpi,
calscaled=.94,
bb=ams,
frak=mma,
frakscaled=.97,
scr=rsfs]{mathalpha}
```

As initially configured, mathalpha makes available the following options:

cal= Select the calligraphic alphabet from the list above.

calscaled= Select a scale factor for cal.

bfcal Force `\mathcal` to point to the bold version.

calsymbols Force the `cal` alphabet to load as a `symbol` font.

scr= Select the script alphabet from the same list.

scrscaled= Select a scale factor for scr.

bfscr Force `\mathscr` to point to the bold version.

scrsymbols Force the `scr` alphabet to load as a `symbol` font.

frak= Select the fraktur alphabet from euler, lucida, mathpi, mma, mt, esstix, boondox, pxtx, stixtwo.

frakscaled= Select a scale factor for frak.

bffrak Force `\mathfrak` to point to the bold version.

fraksymbols Force the `frak` alphabet to load as a `symbol` font.

bb= Select the Blackboard bold alphabet from ams, lucida, mathpi, mma, mt, mth, pazo, fourier, esstix, boondox, px, tx, txof, libus, dsserif, bboldxLight, bboldx, dsfontserif, dsfontsans, stixtwo, stix, ncmbbr, ncrbbk.

bbscaled= Select a scale factor for bb.

bfbb Force `\mathbb` to point to the bold version.

bbsymbols Force the `bb` alphabet to load as a `symbol` font.

oldbold Provide aliases to the new names of the bold versions. For example, prior versions of `mathalpha` used the names `\mathbbb`, `\mathbcal`, `\mathbscr` and `\mathbfrak`, while version 1.14 and higher will use names `\mathbfbb`, `\mathbfcal`, `\mathbfscr` and `\mathbffrak`, in line with unicode math usage. This option will make the old names available as aliases to the new names.

scaled= Select a scale for all alphabets chosen within mathalpha.

showoptions This option throws an error and shows a list of all installed option values for bb, cal, frak and scr on the console.

NOTES

- If bold versions exist, they are loaded and may be used with the macros `\mathbfcal`, `\mathbfbb`, `\mathbffrak` and `\mathbfscr`. (These macro names changed in 2021.)
- If you prefer that the bold weight be the default target from `\mathcal` etc, make use of the new (as of 2021) options `bfcal` etc. If you prefer to use the older names like `\mathbcal`, include the `mathalpha` option `oldbold`.
- Use of zapfc as a value for either cal or scr requires that you install the urwchancal package from `http://mirror.tug.org/fonts/urwchancal`.
  (It is distributed as part of TEX Live and MiKTeX.)
- Use of the rsfso as a value for either cal or scr requires that you install the rsfso package from `http://mirror.tug.org/fonts/rsfso`.
  (It is distributed as part of TEX Live and MiKTeX.)
- Use of mma as a value requires that you have access to the older mathematic fonts from Mathematica versions near 3.
  The support files developed by Jens-Peer Kuska may be downloaded from CTAN. (Search for `Mathematica`.)
  In particular, `wolfram.map` must be enabled. Virtual fonts with metrics that are suitable for math mode are also required.
- Use of mathpi requires that you purchase and install the Adobe Mathematical Pi fonts (#2 and #6) or clones thereof.
- The `pxtx` package consists of virtual fonts drawn from the math alphabets in the `pxfonts` and `txfonts` packages, with modified metrics. The calligraphic fonts are identical to those in the Mathematica package, but the others seem distinct. The `pxtx` package is part of TEX Live and MiKTeX.
- The Adobe Bickham Script Pro font collection in OpenType format is rather expensive but quite elegant. Its upper-case glyphs are well-suited for adaptation as a math calligraphic font once the slant is reduced. The bickham package makes available virtual fonts and LATEX support files for these fonts, and can be used as the target for `\mathcal` and `\mathscr` as well as their bold variants. You may use the target bickham to load regular and bold weight of BickhamScriptPro. The target bickhams instead loads bickham-s (the semibold weight) in place of bickham-r, the regular weight.

Note that this requires that you install the newest version of the bickham package, which provides support for the semibold weight.

- The ESSTIX collection is a creation of Elsevier Publishing in 2000, though never officially released by them. Before development was complete, the collection was donated to the STIX math font project, to which it seems to have been a precursor. Distribution has since been deprecated, but in my opinion, math alphabet fonts, especially math script fonts, are so rare that none should be allowed to become extinct. The BlackBoard Bold ESSTIX font (ESSTIX14) is close to both the mathpi and Fourier Blackboard Bold fonts, and the fraktur ESSTIX font (ESSTIX15) is similar to mathpi fraktur. However, the ESSTIX script font (ESSTIX13) seems to be a distinct and interesting face. The PostScript versions of these fonts have been hard to find, but the TrueType versions may be found embedded within the Amaya project, available at
`http://www.w3.org/Amaya/`.
The ESSTIX PostScript fonts, virtual math fonts and LaTeX support files are distributed as part of TeX Live and MiKTeX.
This provides virtual fonts with tfm names esstixcal, esstixbb and esstixfrak.

- The STIX fonts are currently (2021) distributed only in OpenType and PostScript (`pfb`) formats. The PostScript BOONDOX fonts (in the USA, *the boondocks* and *the sticks* are essentially synonymous) containing their calligraphic, fraktur and double-struck (blackboard bold) alphabets in regular and bold weights were manufactured from STIX `.otf` fonts using FontForge. Virtual fonts were then created using fontinst to customize the metrics for positioning accents and subscripts.

- STIX has now become a legacy package and is being replaced by STIX2, which has many similarities to STIX but also many dramatic differences. The calligraphic alphabets are quite different, the fraktur and blackboard bold not so much.

- Two new BB options are available starting with `mathalpha` 1.144—ncmbbr and ncmbbk, both derived from the BB alphabets in `NewCMMath`, with suffixes `r`, `k` standing for regular and book weights respectively. (There is also a bold weight (more properly medium weight) with suffix `b`.) For comparison: weights `r`, `k`, `b` look like $\mathbb{AB12}$, $\mathbb{AB12}$ and $\mathbb{AB12}$. Regular is IMO suited only for Computer Modern based math fonts.

- TeX permits only 16 different math families, and a typical math font setup can easily lead to 7 or 8 before you even begin. The `bm` package will add 4 additional bold families even if you don't make any use of them. It's easy to see that adding new math alphabets can lead to problems with the math families count, and the problems can be compounded if the alphabets were not set up with these issues in mind.

  There are two basic ways to construct a math alphabet. In both cases, one must construct the information normally provided in the fd file, but which may be set out just as well in the `sty` file. This information links the font name and attributes (bold, medium, etc) to the name of the corresponding `tfm` files.
  Case 1: You wish to be able to access at most the upper and lower case letters and any available numerals as mathematical symbols. The appropriate command is `\DeclareMathAlphabet`, which does not add to the math families count if not used in the document. Moreover, in recent versions of LaTeX, `\DeclareMathAlphabet` does not add to that count except in the math fragment in which it is applied.
  Case 2: You wish to be able to access other slots to create mathematic symbols. These requires that you use the less efficient `\DeclareSymbolFont`, which does add to the math families count even if not used in the document. In this package I have tried to maximize the use of `\DeclareMathAlphabet`.

The other significant hazard in using external math alphabets is that, with a normal construction, if you use only the bold version of a math alphabet, you will use up two math family slots—one for normal weight and one for bold. It is therefore advantageous to provide a means of loading only the bold weight and referencing it as if it were the normal weight. This is possible in versions 1.14 and higher, using the options described above.

- In view of the information in the preceding above, you may wish to consider, given a choice, of how a given alphabet is constructed. If using **Case 1**, the available characters that are not Roman alphabetic or the numeral 1 can be accessed only as text characters, and that may be acceptable as you can insert text in a math environment using a simple `\mbox{}` if you are in basic `displaystyle` or `textstyle`, and with the more capable `\text{}` macro if you are using `amsmath`. Here is a small example. Were you to load this package with the line

  ```
  \usepackage[bb=stixtwo]{mathalpha}
  ```

  the package would start to read the lines

  ```
  \DeclareFontFamily{U}{stixtwobb}{\skewchar\font=45}%
  \DeclareFontShape{U}{stixtwobb}{m}{n}{<->\mathalfa@bbscaled  stix2-mathbb}{}
  ```

  which define a font family `stixtwobb` with encoding `U` (undefined) whose only attribute entry is `{m}{n}` (regular weight, upright shape) which, when invoked, loads its glyph metric data from `stix2-mathbb.tfm` scaled by the factor `\mathalfa@bbscaled` that was set by the option `bbscaled`. Following that, the code test whether the option `bbsymbols` was given, and, since not, it proceeds to use `\DeclareMathAlphabet`. It then makes definitions of the symbols outside the range, like

  ```
  \def\txtbbGamma{{\usefont{U}{stixtwobb}{m}{n}\char0 }}
  \def\txtbbdotlessi{{\usefont{U}{stixtwobb}{m}{n}\char123 }}
  \def\txtbbzero{{\usefont{U}{stixtwobb}{m}{n}0}}
  \def\txtbbtwo{{\usefont{U}{stixtwobb}{m}{n}2}}
  ```

  Then, assuming `amsmath` is loaded,
  `$\text{\txtbbGamma}^2+\text{\txtbbtwo}=\text{\txtbbdotlessi}$`
  renders as $\mathbb{\Gamma}^2 + \mathbb{2} = \mathbb{\imath}$. Obviously, some manual corrections to the spacing may be needed.

The following are my opinions. No objective judgment should be inferred.

- If your interest in math fonts goes beyond the basic level, you should look into the commercial products Lucida from `http://www.tug.org/store/lucida/order.html` and Mathtime Pro 2 from `http://pctex.com`. Both are high quality products, and are excellent values for the prices. Even if you only use small pieces of the collections, these are much better buys than most commercial text fonts.
- The Mathematica fonts are not of very high quality as a collection, but they have some good parts. In particular, the calligraphic math font may be turned into a useful target for `\mathcal` after its metrics have been fine-tuned. You are missing out on some good stuff if you don't install this free collection.
- The `txfonts` and `pxfonts` packages provide a number of math alphabets that deserve more attention—the fraktur in particular is quite handsome but should perhaps be scaled up a bit.
- The rsfs package is not suitable for `\mathcal`, being much too slanted. The best options for `\mathcal` are rsfso, esstix, boondoxo and mt, the latter requiring the (non-free) mtpro2 collection.

- If you own the mtpro2 collection, look into the 'curly' script font, which seems useful, though a bit heavy.
- It is questionable whether there is value in the Mathpi fonts given that there are free close approximants to each of them.
- The STIX (BOONDOX) calligraphic font is quite handsome. I prefer it to be less sloped, along the lines of rsfso. This is provided by the option `boondoxo`, which provides virtual fonts sloped approximately like `rsfso`.

Height Comparisons:

The CapHeight of a font is supposed to represent the height of capital letters in the font in units where 1000 is equal to `1em`, the size of `\quad` which, for a font of nominal size `10pt` is in most cases equal to `10pt`. Script fonts often have irregularly sized capital letters, and the CapHeight should perhaps represent the median height of capitals. This is not always so. For example, pzc (Adobe Zapf Chancery) and uzc (its URW clone) have the same glyph metrics, but their CapHeights are listed respectively as 708 and 573. These numbers, taken from their AFM files, represent in the first case the second greatest height of capital letters and the second case the second smallest. If the CapHeight is to provide useful information about scaling the font, a more central value is 595, indicating that in most cases, Zapf Chancery usually needs to be scaled up by about 15%.

For the purpose of making scale factors to mediate between these disparate fonts, the following chart may be helpful.

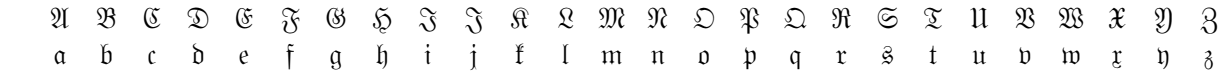
Computer Modern Roman (cmr10)	683
Zapf Chancery (pzcmi/uzcmi)	595
Euler fraktur(eufm10)	690
Euler script(eusm10)	695
rsfs/rsfso	710
Computer Modern calligraphic (cmsy10)	703
Mathpi calligraphic (mh2scr)	720
Mathpi fraktur (mh2)	762
Mathpi Blackboard bold (mh6)	720
pxtx calligraphic (txr-cal)	684
pxtx calligraphic-bold (txb-cal)	684
pxtx fraktur (txr-frak)	684
pxtx fraktur-bold (txb-frak)	679
pxtx openface (tx-of)	664
pxtx openface-bold (txr-of)	678
tx double-struck (txr-ds)	684
px double-struck (pxr-ds)	693
px double-struck-bold (pxb-ds)	698
bickham calligraphic (bickham-r)	683
bickham calligraphic (bickham-s)	683
Lucida calligraphic (lbms)	723
Lucida Blackboard bold (lbma)	723
Lucida fraktur (lbl)	741
mtpro2 calligraphic (mt2mst)	702
mtpro2 curly (mt2mct)	702

mtpro2 Blackboard bold (mt2bbt)	690
mtpro2 Holey Roman (mt2hrbt)	690
Mathematica calligraphic (Mathematica5)	685
Mathematica fraktur (Mathematica6)	690
Mathematica Blackboard bold (Mathematica7)	662
Mathpazo Blackboard bold (fplmbb)	692
Fourier Blackboard bold (fourier-bb)	693
ESSTIX Calligraphic (ESSTIX13)	692
ESSTIX Blackboard bold (ESSTIX14)	696
ESSTIX fraktur (ESSTIX15)	700
BOONDOX Calligraphic	687
BOONDOX Blackboard bold	662
BOONDOX fraktur	695

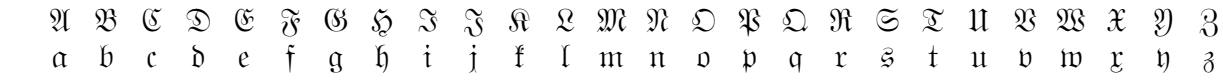
Here are some samples from the fonts mentioned above:

Fraktur:

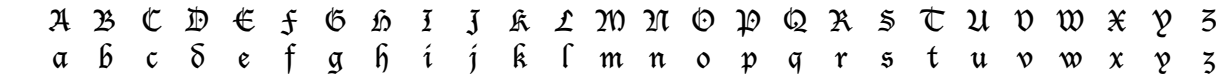
`esstix` (ESSTIX fraktur):



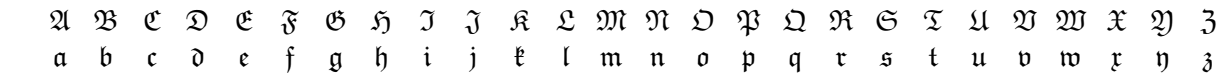
`mathpi` (Mathpi fraktur):



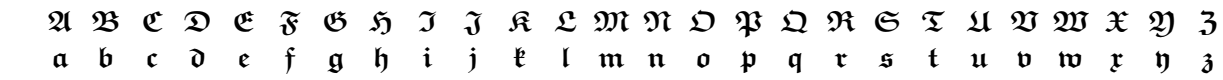
`lucida` (Lucida fraktur):



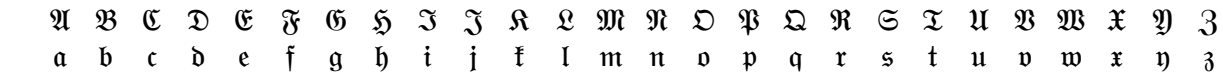
`euler` (Euler fraktur):



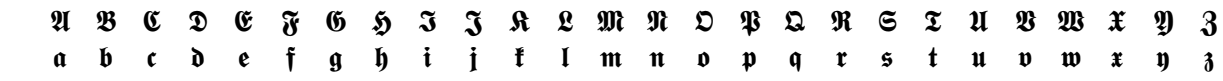
`euler` (Euler fraktur-bold):



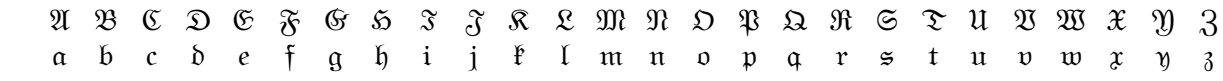
`pxtx` (pxtx fraktur):



`pxtx` (pxtx fraktur-bold):



`mt` (Mathtime Pro 2 fraktur):



`mt` (Mathtime Pro 2 fraktur-bold):

𝔄 𝔅 ℭ 𝔇 𝔈 𝔉 𝔊 ℌ ℑ 𝔍 𝔎 𝔏 𝔐 𝔑 𝔒 𝔓 𝔔 ℜ 𝔖 𝔗 𝔘 𝔙 𝔚 𝔛 𝔜 ℨ
𝔞 𝔟 𝔠 𝔡 𝔢 𝔣 𝔤 𝔥 𝔦 𝔧 𝔨 𝔩 𝔪 𝔫 𝔬 𝔭 𝔮 𝔯 𝔰 𝔱 𝔲 𝔳 𝔴 𝔵 𝔶 𝔷

`mma` (Mathematica fraktur):

𝔄 𝔅 ℭ 𝔇 𝔈 𝔉 𝔊 ℌ ℑ 𝔍 𝔎 𝔏 𝔐 𝔑 𝔒 𝔓 𝔔 ℜ 𝔖 𝔗 𝔘 𝔙 𝔚 𝔛 𝔜 ℨ
𝔞 𝔟 𝔠 𝔡 𝔢 𝔣 𝔤 𝔥 𝔦 𝔧 𝔨 𝔩 𝔪 𝔫 𝔬 𝔭 𝔮 𝔯 𝔰 𝔱 𝔲 𝔳 𝔴 𝔵 𝔶 𝔷

`mma` (Mathematica fraktur-bold):

𝕬 𝕭 𝕮 𝕯 𝕰 𝕱 𝕲 𝕳 𝕴 𝕵 𝕶 𝕷 𝕸 𝕹 𝕺 𝕻 𝕼 𝕽 𝕾 𝕿 𝖀 𝖁 𝖂 𝖃 𝖄 𝖅
𝖆 𝖇 𝖈 𝖉 𝖊 𝖋 𝖌 𝖍 𝖎 𝖏 𝖐 𝖑 𝖒 𝖓 𝖔 𝖕 𝖖 𝖗 𝖘 𝖙 𝖚 𝖛 𝖜 𝖝 𝖞 𝖟

`boondox` (BOONDOX fraktur):

𝔄 𝔅 ℭ 𝔇 𝔈 𝔉 𝔊 ℌ ℑ 𝔍 𝔎 𝔏 𝔐 𝔑 𝔒 𝔓 𝔔 ℜ 𝔖 𝔗 𝔘 𝔙 𝔚 𝔛 𝔜 ℨ
𝔞 𝔟 𝔠 𝔡 𝔢 𝔣 𝔤 𝔥 𝔦 𝔧 𝔨 𝔩 𝔪 𝔫 𝔬 𝔭 𝔮 𝔯 𝔰 𝔱 𝔲 𝔳 𝔴 𝔵 𝔶 𝔷

`boondox` (BOONDOX fraktur-bold):

𝕬 𝕭 𝕮 𝕯 𝕰 𝕱 𝕲 𝕳 𝕴 𝕵 𝕶 𝕷 𝕸 𝕹 𝕺 𝕻 𝕼 𝕽 𝕾 𝕿 𝖀 𝖁 𝖂 𝖃 𝖄 𝖅
𝖆 𝖇 𝖈 𝖉 𝖊 𝖋 𝖌 𝖍 𝖎 𝖏 𝖐 𝖑 𝖒 𝖓 𝖔 𝖕 𝖖 𝖗 𝖘 𝖙 𝖚 𝖛 𝖜 𝖝 𝖞 𝖟

`stix2` (STIX2 fraktur):

𝔄 𝔅 ℭ 𝔇 𝔈 𝔉 𝔊 ℌ ℑ 𝔍 𝔎 𝔏 𝔐 𝔑 𝔒 𝔓 𝔔 ℜ 𝔖 𝔗 𝔘 𝔙 𝔚 𝔛 𝔜 ℨ
𝔞 𝔟 𝔠 𝔡 𝔢 𝔣 𝔤 𝔥 𝔦 𝔧 𝔨 𝔩 𝔪 𝔫 𝔬 𝔭 𝔮 𝔯 𝔰 𝔱 𝔲 𝔳 𝔴 𝔵 𝔶 𝔷

`stix2` (STIX2 fraktur-Bold):

𝕬 𝕭 𝕮 𝕯 𝕰 𝕱 𝕲 𝕳 𝕴 𝕵 𝕶 𝕷 𝕸 𝕹 𝕺 𝕻 𝕼 𝕽 𝕾 𝕿 𝖀 𝖁 𝖂 𝖃 𝖄 𝖅
𝖆 𝖇 𝖈 𝖉 𝖊 𝖋 𝖌 𝖍 𝖎 𝖏 𝖐 𝖑 𝖒 𝖓 𝖔 𝖕 𝖖 𝖗 𝖘 𝖙 𝖚 𝖛 𝖜 𝖝 𝖞 𝖟

Calligraphic and Script:

Upright:

`euler` (Euler script):

𝒜 ℬ 𝒞 𝒟 ℰ ℱ 𝒢 ℋ ℐ 𝒥 𝒦 ℒ ℳ 𝒩 𝒪 𝒫 𝒬 ℛ 𝒮 𝒯 𝒰 𝒱 𝒲 𝒳 𝒴 𝒵

`euler` (Euler script-bold):

𝓐 𝓑 𝓒 𝓓 𝓔 𝓕 𝓖 𝓗 𝓘 𝓙 𝓚 𝓛 𝓜 𝓝 𝓞 𝓟 𝓠 𝓡 𝓢 𝓣 𝓤 𝓥 𝓦 𝓧 𝓨 𝓩

`mtc` (Mathtime Pro 2 Curly script):

𝔄 𝔅 ℭ 𝔇 𝔈 𝔉 𝔊 ℌ 𝔩 𝔍 𝔎 𝔏 𝔐 𝔑 𝔒 𝔓 𝔔 ℜ 𝔖 𝔗 𝔘 𝔙 𝔚 𝔛 𝔜 ℨ

`txupr` (TXUprCal):

𝒜 ℬ 𝒞 𝒟 ℰ ℱ 𝒢 ℋ ℐ 𝒥 𝒦 ℒ ℳ 𝒩 𝒪 𝒫 𝒬 ℛ 𝒮 𝒯 𝒰 𝒱 𝒲 𝒳 𝒴 𝒵

`boondoxupr` (BOONDOXUprScr):

𝒜 ℬ 𝒞 𝒟 ℰ ℱ 𝒢 ℋ ℐ 𝒥 𝒦 ℒ ℳ 𝒩 𝒪 𝒫 𝒬 ℛ 𝒮 𝒯 𝒰 𝒱 𝒲 𝒳 𝒴 𝒵
𝒶 𝒷 𝒸 𝒹 ℯ 𝒻 ℊ 𝒽 𝒾 𝒿 𝓀 𝓁 𝓂 𝓃 ℴ 𝓅 𝓆 𝓇 𝓈 𝓉 𝓊 𝓋 𝓌 𝓍 𝓎 𝓏

Restrained:

`cm` (CM calligraphic, cmsy):

$\mathcal{A}$ $\mathcal{B}$ $\mathcal{C}$ $\mathcal{D}$ $\mathcal{E}$ $\mathcal{F}$ $\mathcal{G}$ $\mathcal{H}$ $\mathcal{I}$ $\mathcal{J}$ $\mathcal{K}$ $\mathcal{L}$ $\mathcal{M}$ $\mathcal{N}$ $\mathcal{O}$ $\mathcal{P}$ $\mathcal{Q}$ $\mathcal{R}$ $\mathcal{S}$ $\mathcal{T}$ $\mathcal{U}$ $\mathcal{V}$ $\mathcal{W}$ $\mathcal{X}$ $\mathcal{Y}$ $\mathcal{Z}$

`cm` (CM calligraphic-bold, cmbsy):

$\boldsymbol{\mathcal{A}}$ $\boldsymbol{\mathcal{B}}$ $\boldsymbol{\mathcal{C}}$ $\boldsymbol{\mathcal{D}}$ $\boldsymbol{\mathcal{E}}$ $\boldsymbol{\mathcal{F}}$ $\boldsymbol{\mathcal{G}}$ $\boldsymbol{\mathcal{H}}$ $\boldsymbol{\mathcal{I}}$ $\boldsymbol{\mathcal{J}}$ $\boldsymbol{\mathcal{K}}$ $\boldsymbol{\mathcal{L}}$ $\boldsymbol{\mathcal{M}}$ $\boldsymbol{\mathcal{N}}$ $\boldsymbol{\mathcal{O}}$ $\boldsymbol{\mathcal{P}}$ $\boldsymbol{\mathcal{Q}}$ $\boldsymbol{\mathcal{R}}$ $\boldsymbol{\mathcal{S}}$ $\boldsymbol{\mathcal{T}}$ $\boldsymbol{\mathcal{U}}$ $\boldsymbol{\mathcal{V}}$ $\boldsymbol{\mathcal{W}}$ $\boldsymbol{\mathcal{X}}$ $\boldsymbol{\mathcal{Y}}$ $\boldsymbol{\mathcal{Z}}$

`zapfc` (Zapf Chancery):

$\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}$

`lucida` (Lucida calligraphic):

$\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}$

`lucida` (Lucida calligraphic-bold):

$\boldsymbol{\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}}$

`mma` (Mathematica script):

$\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}$

`mma` (Mathematica script-bold):

$\boldsymbol{\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}}$

`pxtx` (pxtx script):

$\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}$

`pxtx` (pxtx script-bold):

$\boldsymbol{\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}}$

`stix-plain` (STIX Calligraphic):

$\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}$

`stix-plain` (STIX Calligraphic-bold):

$\boldsymbol{\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}}$

`stix2-plain` (STIX2 Calligraphic):

$\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}$

Embellished:

`mt` (Mathtime Pro 2 script):

$\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}$

`mt` (Mathtime Pro 2 script-bold):

$\boldsymbol{\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}}$

`mathpi` (Mathpi script):

$\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}$

`rsfso`:

$\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}$

`esstix` (ESSTIX calligraphic):

$\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}$
$a\ b\ c\ d\ e\ f\ g\ h\ i\ j\ k\ l\ m\ n\ o\ p\ q\ r\ s\ t\ u\ v\ w\ x\ y\ z$

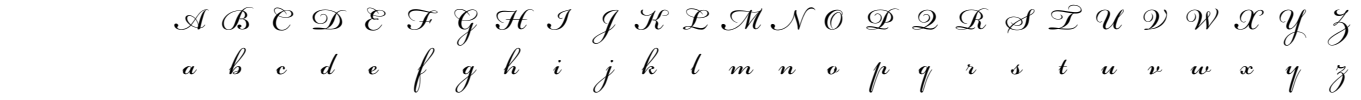
`dutchcal` (dutchcal calligraphic):

$\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}$
$a\ b\ c\ d\ e\ f\ g\ h\ i\ j\ k\ l\ m\ n\ o\ p\ q\ r\ s\ t\ u\ v\ w\ x\ y\ z$

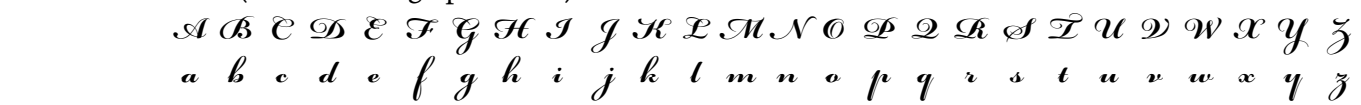
`dutchcal` (dutchcal calligraphic-bold):

$\boldsymbol{\mathcal{A}\ \mathcal{B}\ \mathcal{C}\ \mathcal{D}\ \mathcal{E}\ \mathcal{F}\ \mathcal{G}\ \mathcal{H}\ \mathcal{I}\ \mathcal{J}\ \mathcal{K}\ \mathcal{L}\ \mathcal{M}\ \mathcal{N}\ \mathcal{O}\ \mathcal{P}\ \mathcal{Q}\ \mathcal{R}\ \mathcal{S}\ \mathcal{T}\ \mathcal{U}\ \mathcal{V}\ \mathcal{W}\ \mathcal{X}\ \mathcal{Y}\ \mathcal{Z}}$
$\boldsymbol{a\ b\ c\ d\ e\ f\ g\ h\ i\ j\ k\ l\ m\ n\ o\ p\ q\ r\ s\ t\ u\ v\ w\ x\ y\ z}$

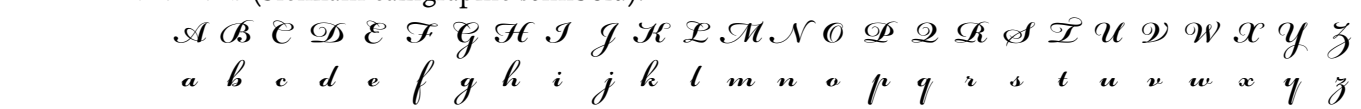
`bickham` (bickham calligraphic):



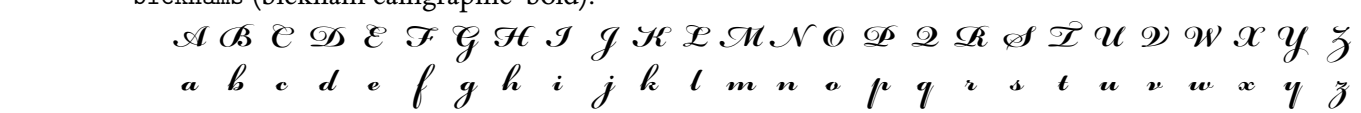
`bickham` (bickham calligraphic-bold):



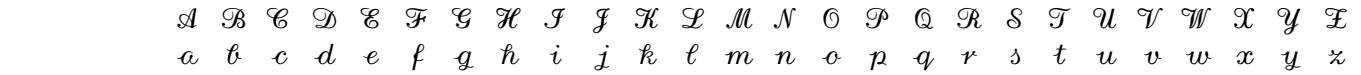
`bickhams` (bickham calligraphic semibold):



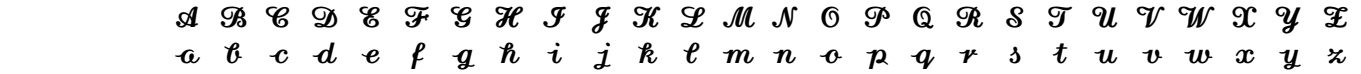
`bickhams` (bickham calligraphic-bold):



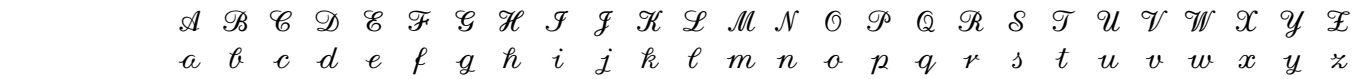
`boondoxo` (BOONDOX Calligraphic Oblique):



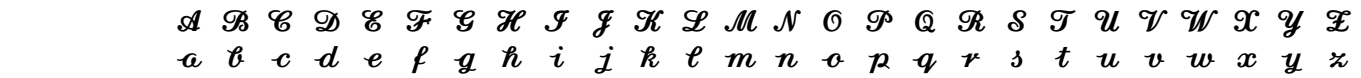
`boondoxo` (BOONDOX Calligraphic Oblique-bold):



`stix2-fancy` (STIX2 Script):

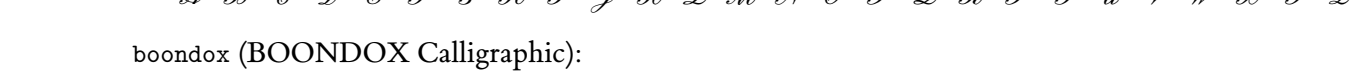


`stix2-fancy` (STIX2 Script-bold):

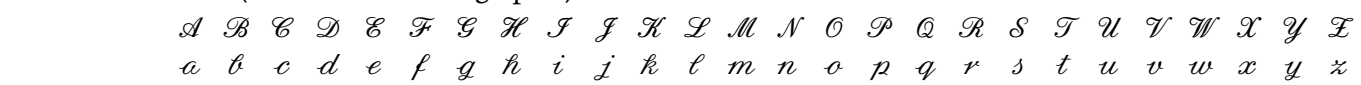


Heavily Sloped:

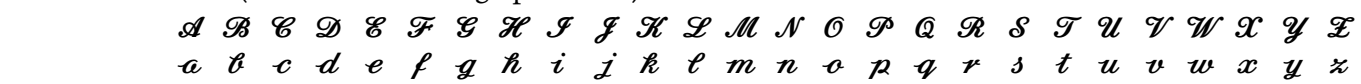
`rsfs`:



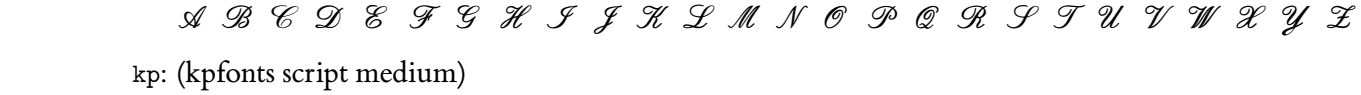
`boondox` (BOONDOX Calligraphic):



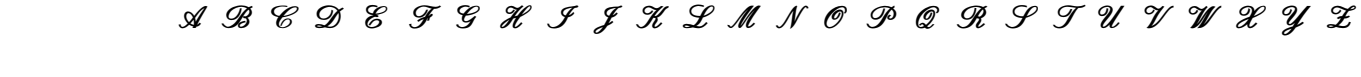
`boondox` (BOONDOX Calligraphic-bold):



`kp`: (kpfonts script regular)



`kp`: (kpfonts script medium)



Double-Struck (Blackboard Bold):

Hollowed-out Shapes:

`ams` (AMS bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`mth` (Mathtime Pro 2 Holey Roman):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`mth` (Mathtime Pro 2 Holey Roman-bold):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`txof` (tx of):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`txof` (tx of bold):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

Geometric Shapes, Serifed:

`pazo` (Mathpazo bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`px` (px bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`px` (px bb bold):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`tx` (tx bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ
𝕒 𝕓 𝕔 𝕕 𝕖 𝕗 𝕘 𝕙 𝕚 𝕛 𝕜 𝕝 𝕞 𝕟 𝕠 𝕡 𝕢 𝕣 𝕤 𝕥 𝕦 𝕧 𝕨 𝕩 𝕪 𝕫

`libus` (libertinust1-mathbb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ
𝕒 𝕓 𝕔 𝕕 𝕖 𝕗 𝕘 𝕙 𝕚 𝕛 𝕜 𝕝 𝕞 𝕟 𝕠 𝕡 𝕢 𝕣 𝕤 𝕥 𝕦 𝕧 𝕨 𝕩 𝕪 𝕫

`ncmbbr` (mathalpha-ncmbb-regular):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ
𝕒 𝕓 𝕔 𝕕 𝕖 𝕗 𝕘 𝕙 𝕚 𝕛 𝕜 𝕝 𝕞 𝕟 𝕠 𝕡 𝕢 𝕣 𝕤 𝕥 𝕦 𝕧 𝕨 𝕩 𝕪 𝕫

`ncmbbk` (mathalpha-ncmbb-book):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ
𝕒 𝕓 𝕔 𝕕 𝕖 𝕗 𝕘 𝕙 𝕚 𝕛 𝕜 𝕝 𝕞 𝕟 𝕠 𝕡 𝕢 𝕣 𝕤 𝕥 𝕦 𝕧 𝕨 𝕩 𝕪 𝕫

`ncmbbb` (mathalpha-ncmbb-bold):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ
𝕒 𝕓 𝕔 𝕕 𝕖 𝕗 𝕘 𝕙 𝕚 𝕛 𝕜 𝕝 𝕞 𝕟 𝕠 𝕡 𝕢 𝕣 𝕤 𝕥 𝕦 𝕧 𝕨 𝕩 𝕪 𝕫

`dsfont-serif` (Dsfont Serif):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ
𝔸 ℎ 𝕜

Geometric Shapes, Sans Serif:

`lucida` (Lucida bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`lucida` (Lucida Bold bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`mathpi` (Mathpi bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`mt` (Mathtime Pro 2 bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`mt` (Mathtime Pro 2 bb-bold):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`mma` (Mathematica bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`mma` (Mathematica bb-bold):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`fourier` (Fourier bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`esstix` (ESSTIX bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`boondox` (BOONDOX bb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`boondox` (BOONDOX bb-bold):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ

`bboldx` (Bboldx-light):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ
𝕒 𝕓 𝕔 𝕕 𝕖 𝕗 𝕘 𝕙 𝕚 𝕛 𝕜 𝕝 𝕞 𝕟 𝕠 𝕡 𝕢 𝕣 𝕤 𝕥 𝕦 𝕧 𝕨 𝕩 𝕪 𝕫

`bboldx` (Bboldx-regular):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ
𝕒 𝕓 𝕔 𝕕 𝕖 𝕗 𝕘 𝕙 𝕚 𝕛 𝕜 𝕝 𝕞 𝕟 𝕠 𝕡 𝕢 𝕣 𝕤 𝕥 𝕦 𝕧 𝕨 𝕩 𝕪 𝕫

`bboldx` (Bboldx-bold):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ
𝕒 𝕓 𝕔 𝕕 𝕖 𝕗 𝕘 𝕙 𝕚 𝕛 𝕜 𝕝 𝕞 𝕟 𝕠 𝕡 𝕢 𝕣 𝕤 𝕥 𝕦 𝕧 𝕨 𝕩 𝕪 𝕫

`dsfont-sans` (Dsfont Sans):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ
𝔸 ℍ 𝕂

`stix2` (stix2-mathbb):

𝔸 𝔹 ℂ 𝔻 𝔼 𝔽 𝔾 ℍ 𝕀 𝕁 𝕂 𝕃 𝕄 ℕ 𝕆 ℙ ℚ ℝ 𝕊 𝕋 𝕌 𝕍 𝕎 𝕏 𝕐 ℤ
𝕒 𝕓 𝕔 𝕕 𝕖 𝕗 𝕘 𝕙 𝕚 𝕛 𝕜 𝕝 𝕞 𝕟 𝕠 𝕡 𝕢 𝕣 𝕤 𝕥 𝕦 𝕧 𝕨 𝕩 𝕪 𝕫

stix (stix-mathbb):

$\mathbb{A}\ \mathbb{B}\ \mathbb{C}\ \mathbb{D}\ \mathbb{E}\ \mathbb{F}\ \mathbb{G}\ \mathbb{H}\ \mathbb{I}\ \mathbb{J}\ \mathbb{K}\ \mathbb{L}\ \mathbb{M}\ \mathbb{N}\ \mathbb{O}\ \mathbb{P}\ \mathbb{Q}\ \mathbb{R}\ \mathbb{S}\ \mathbb{T}\ \mathbb{U}\ \mathbb{V}\ \mathbb{W}\ \mathbb{X}\ \mathbb{Y}\ \mathbb{Z}$
$\mathbb{a}\ \mathbb{b}\ \mathbb{c}\ \mathbb{d}\ \mathbb{e}\ \mathbb{f}\ \mathbb{g}\ \mathbb{h}\ \mathbb{i}\ \mathbb{j}\ \mathbb{k}\ \mathbb{l}\ \mathbb{m}\ \mathbb{n}\ \mathbb{o}\ \mathbb{p}\ \mathbb{q}\ \mathbb{r}\ \mathbb{s}\ \mathbb{t}\ \mathbb{u}\ \mathbb{v}\ \mathbb{w}\ \mathbb{x}\ \mathbb{y}\ \mathbb{z}$

stix (stix-mathbb-bold):

$\mathbb{A}\ \mathbb{B}\ \mathbb{C}\ \mathbb{D}\ \mathbb{E}\ \mathbb{F}\ \mathbb{G}\ \mathbb{H}\ \mathbb{I}\ \mathbb{J}\ \mathbb{K}\ \mathbb{L}\ \mathbb{M}\ \mathbb{N}\ \mathbb{O}\ \mathbb{P}\ \mathbb{Q}\ \mathbb{R}\ \mathbb{S}\ \mathbb{T}\ \mathbb{U}\ \mathbb{V}\ \mathbb{W}\ \mathbb{X}\ \mathbb{Y}\ \mathbb{Z}$
$\mathbb{a}\ \mathbb{b}\ \mathbb{c}\ \mathbb{d}\ \mathbb{e}\ \mathbb{f}\ \mathbb{g}\ \mathbb{h}\ \mathbb{i}\ \mathbb{j}\ \mathbb{k}\ \mathbb{l}\ \mathbb{m}\ \mathbb{n}\ \mathbb{o}\ \mathbb{p}\ \mathbb{q}\ \mathbb{r}\ \mathbb{s}\ \mathbb{t}\ \mathbb{u}\ \mathbb{v}\ \mathbb{w}\ \mathbb{x}\ \mathbb{y}\ \mathbb{z}$

stix (stix-mathbbit):

$\mathbb{A}\ \mathbb{B}\ \mathbb{C}\ \mathbb{D}\ \mathbb{E}\ \mathbb{F}\ \mathbb{G}\ \mathbb{H}\ \mathbb{I}\ \mathbb{J}\ \mathbb{K}\ \mathbb{L}\ \mathbb{M}\ \mathbb{N}\ \mathbb{O}\ \mathbb{P}\ \mathbb{Q}\ \mathbb{R}\ \mathbb{S}\ \mathbb{T}\ \mathbb{U}\ \mathbb{V}\ \mathbb{W}\ \mathbb{X}\ \mathbb{Y}\ \mathbb{Z}$
$\mathbb{a}\ \mathbb{b}\ \mathbb{c}\ \mathbb{d}\ \mathbb{e}\ \mathbb{f}\ \mathbb{g}\ \mathbb{h}\ \mathbb{i}\ \mathbb{j}\ \mathbb{k}\ \mathbb{l}\ \mathbb{m}\ \mathbb{n}\ \mathbb{o}\ \mathbb{p}\ \mathbb{q}\ \mathbb{r}\ \mathbb{s}\ \mathbb{t}\ \mathbb{u}\ \mathbb{v}\ \mathbb{w}\ \mathbb{x}\ \mathbb{y}\ \mathbb{z}$

stix (stix-mathbbit-bold):

$\mathbb{A}\ \mathbb{B}\ \mathbb{C}\ \mathbb{D}\ \mathbb{E}\ \mathbb{F}\ \mathbb{G}\ \mathbb{H}\ \mathbb{I}\ \mathbb{J}\ \mathbb{K}\ \mathbb{L}\ \mathbb{M}\ \mathbb{N}\ \mathbb{O}\ \mathbb{P}\ \mathbb{Q}\ \mathbb{R}\ \mathbb{S}\ \mathbb{T}\ \mathbb{U}\ \mathbb{V}\ \mathbb{W}\ \mathbb{X}\ \mathbb{Y}\ \mathbb{Z}$
$\mathbb{a}\ \mathbb{b}\ \mathbb{c}\ \mathbb{d}\ \mathbb{e}\ \mathbb{f}\ \mathbb{g}\ \mathbb{h}\ \mathbb{i}\ \mathbb{j}\ \mathbb{k}\ \mathbb{l}\ \mathbb{m}\ \mathbb{n}\ \mathbb{o}\ \mathbb{p}\ \mathbb{q}\ \mathbb{r}\ \mathbb{s}\ \mathbb{t}\ \mathbb{u}\ \mathbb{v}\ \mathbb{w}\ \mathbb{x}\ \mathbb{y}\ \mathbb{z}$

NOTES:

- Not many Blackboard Bold fonts contain Greek alphabets. A notable exception is `bbold` and its new successor, `bboldx`. The latest version of `dsserif` supports most uppercase Greek letters.
- Several Blackboard Bold fonts (`STIX*`, `\tt ncmbb*`) contain a few Greek, dotless and slanted symbols, typically $\mathbb{1}\mathbb{J}\pi\gamma\mathbb{\Gamma}\mathbb{\Pi}\sum\mathbb{D}\mathbb{d}\mathbb{e}\mathbb{i}\mathbb{j}$. Using one of these symbols in a fragment of math is best handled by using `\usefont` and the `amsmath` `\text` macro. For example, in the current math font, `stixtwo`, $\mathbb{\Gamma}$ is in slot 0 and you can define a text character for it by

  ```
  \def\txtbbGamma{{\usefont{U}{stixtwobb}{m}{n}\char0 }}
  ```

  and then use it in a math expression, like `$\text{\txtbbGamma}+\frac{1}{\text{\txtbbGamma}}$`, which renders as $\mathbb{\Gamma}+\frac{1}{\mathbb{\Gamma}}$. Note the correct sizing in the denominator. (Actually, this definition is already in `mathalpha.sty`, but that may not be the case with other math alphabets.)
- A growing number of Blackboard Bold fonts contain numerals: all `STIX` and `BOONDOX`, all `bboldx`, all `ncmbb*`, `dsserif`, `tx` offer a full list of numerals, and `pazo` contains the most import figure, $\mathbb{1}$.
- Unlike the original STIX `type1` fonts, STIX2 `type1` does not provide bold weight for blackboard bold and blackboard bold italic, and the latter has no alphabetic glyphs as of October 2021.
- Lucida fonts generally need to be reduced in scale to match other math and text fonts.
- Zapf Chancery needs to be scaled up by 15% or so. This font is not really suited for use as a math alphabet due to the disparate heights and depths and the long tails on some glyphs. Use with care.
- Mathematica fraktur is quite readable, but not very attractive, seeming to have random variations in baseline and height. It's also a bit too heavy to be a good match to most other fonts. Similar comments could apply to Lucida fraktur, which has a very distinctive appearance with some features more similar to Duc de Berry than to other fraktur fonts.
- The calligraphic fonts break down into four natural groups—(i) the upright styled Euler and Curly; (ii) the less-embellished CM, Lucida, Zapf Chancery, ESSTIX, dutchcal, Mathematica and pxtx; (iii) the moderately sloped but more embellished Mathpi, Mathtime, bickham, rsfso and boondoxo; (iv) the heavily sloped rsfs and the slightly less sloped boondox. My preference, if not using mathtime or lucida, is to set `\mathcal` to one from group (ii) and `\mathscr` to one from group (iii).

- Blackboard bold can look poor in some cases. In my opinion, AMS bb and some of the others show up as ghostly (gray and indistinct) especially on the screen and may not appear to match the weights of other math glyphs. (AMS bb, Mathtime Pro 2 Holey Roman and the txof bb fonts appear to be formed by removing the interiors of solid glyphs from a bold, serifed font. Mathtime Pro 2 Holey Roman Bold is a much better fit to most math fonts of weight heavier than Computer Modern.) Fourier, Mathpi, ESSTIX and boondox bb appear to be very close in style, with mathpi bb a bit less sharp. Mathpazo bb, Mathematica bb, px bb and tx bb have a heavier appearance and should work better with fonts other than Computer Modern.