

# The **mathastext** package

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## Abstract

The **mathastext** package automatically (or only locally) changes the fonts used in math mode for the letters and digits (and a few other punctuation and symbol signs) and replaces them with the font used for the text. Thus, the package makes it possible to use a quite arbitrary font without worrying too much that it does not have specially designed accompanying math fonts. Also, **mathastext** provides a simple mechanism in order to use more than one math-as-text font in the same document.

## 1 What **mathastext** does

### 1.1 Examples

**mathastext**'s basic aim is to have the same font for text and mathematics. Here is an example with Latin Modern typewriter proportional:

Let  $(X, Y)$  be two functions of a variable  $a$ . If they obey the differential system  $(VI_{v,n})$ :

$$\begin{aligned} a \frac{d}{da} X &= vX - (1 - X^2) \frac{2na}{1 - a^2} \frac{aX + Y}{1 + aXY} \\ a \frac{d}{da} Y &= -(v + 1)Y + (1 - Y^2) \frac{2na}{1 - a^2} \frac{X + aY}{1 + aXY} \end{aligned}$$

then the quantity  $q = a \frac{aX+Y}{X+aY}$  satisfies as function of  $b = a^2$  the  $P_{VI}$  differential equation:

$$\begin{aligned} \frac{d^2 q}{db^2} &= \frac{1}{2} \left\{ \frac{1}{q} + \frac{1}{q-1} + \frac{1}{q-b} \right\} \left( \frac{dq}{db} \right)^2 - \left\{ \frac{1}{b} + \frac{1}{b-1} + \frac{1}{q-b} \right\} \frac{dq}{db} \\ &\quad + \frac{q(q-1)(q-b)}{b^2(b-1)^2} \left\{ \alpha + \frac{\beta b}{q^2} + \frac{\gamma(b-1)}{(q-1)^2} + \frac{\delta b(b-1)}{(q-b)^2} \right\} \end{aligned}$$

with parameters  $(\alpha, \beta, \gamma, \delta) = (\frac{(v+n)^2}{2}, \frac{-(v+n+1)^2}{2}, \frac{n^2}{2}, \frac{1-n^2}{2})$ .

Notice that the Latin (and Greek letters) are in upright shape. But perhaps we insist on obeying the standardized habits:

Let  $(X, Y)$  be two functions of a variable  $a$ . If they obey the differential system  $(VI_{v,n})$ :

$$\begin{aligned} a \frac{d}{da} X &= vX - (1 - X^2) \frac{2na}{1 - a^2} \frac{aX + Y}{1 + aXY} \\ a \frac{d}{da} Y &= -(v + 1)Y + (1 - Y^2) \frac{2na}{1 - a^2} \frac{X + aY}{1 + aXY} \end{aligned}$$

then the quantity  $q = a \frac{aX+Y}{X+aY}$  satisfies as function of  $b = a^2$  the  $P_{VI}$  differential

equation:

$$\frac{d^2 q}{db^2} = \frac{1}{2} \left\{ \frac{1}{q} + \frac{1}{q-1} + \frac{1}{q-b} \right\} \left( \frac{dq}{db} \right)^2 - \left\{ \frac{1}{b} + \frac{1}{b-1} + \frac{1}{q-b} \right\} \frac{dq}{db} \\ + \frac{q(q-1)(q-b)}{b^2(b-1)^2} \left\{ \alpha + \frac{\beta b}{q^2} + \frac{\gamma(b-1)}{(q-1)^2} + \frac{\delta b(b-1)}{(q-b)^2} \right\}$$

with parameters  $(\alpha, \beta, \gamma, \delta) = (\frac{(\nu+n)^2}{2}, \frac{-(\nu+n+1)^2}{2}, \frac{n^2}{2}, \frac{1-n^2}{2})$ .

This was typeset using the Times font (available in any  $\text{\TeX}$  distribution). Let us now be a bit more original and have our mathematics with italic letters from the sans serif font Helvetica, while the letters in text use New Century Schoolbook.

Let  $(X, Y)$  be two functions of a variable  $a$ . If they obey the differential system  $(VI_{\nu,n})$ :

$$a \frac{d}{da} X = \nu X - (1 - X^2) \frac{2na}{1 - a^2} \frac{aX + Y}{1 + aXY} \\ a \frac{d}{da} Y = -(\nu + 1)Y + (1 - Y^2) \frac{2na}{1 - a^2} \frac{X + aY}{1 + aXY}$$

then the quantity  $q = a \frac{aX+Y}{X+aY}$  satisfies as function of  $b = a^2$  the  $P_{VI}$  differential equation:

$$\frac{d^2 q}{db^2} = \frac{1}{2} \left\{ \frac{1}{q} + \frac{1}{q-1} + \frac{1}{q-b} \right\} \left( \frac{dq}{db} \right)^2 - \left\{ \frac{1}{b} + \frac{1}{b-1} + \frac{1}{q-b} \right\} \frac{dq}{db} \\ + \frac{q(q-1)(q-b)}{b^2(b-1)^2} \left\{ \alpha + \frac{\beta b}{q^2} + \frac{\gamma(b-1)}{(q-1)^2} + \frac{\delta b(b-1)}{(q-b)^2} \right\}$$

with parameters  $(\alpha, \beta, \gamma, \delta) = (\frac{(\nu+n)^2}{2}, \frac{-(\nu+n+1)^2}{2}, \frac{n^2}{2}, \frac{1-n^2}{2})$ .

And after all that, we may wish to return to the default math typesetting:

Let  $(X, Y)$  be two functions of a variable  $a$ . If they obey the differential system  $(VI_{\nu,n})$ :

$$a \frac{d}{da} X = \nu X - (1 - X^2) \frac{2na}{1 - a^2} \frac{aX + Y}{1 + aXY} \\ a \frac{d}{da} Y = -(\nu + 1)Y + (1 - Y^2) \frac{2na}{1 - a^2} \frac{X + aY}{1 + aXY}$$

then the quantity  $q = a \frac{aX+Y}{X+aY}$  satisfies as function of  $b = a^2$  the  $P_{VI}$  differential equation with parameters  $(\alpha, \beta, \gamma, \delta) = (\frac{(\nu+n)^2}{2}, \frac{-(\nu+n+1)^2}{2}, \frac{n^2}{2}, \frac{1-n^2}{2})$ .

Notice that the Greek letters also changed according to the *math version*: **mathastext** has indeed some (limited) capabilities to this effect (we used the LGR encoded fonts **lmtt**, **txr** (from **txfonts** package), and **lmss**). As an aside, I mention here that for documents containing many fonts **pdflatex** produces truly larger files than **dvipdfmx** which embeds them in a compressed format (for this doc with the source code included — 50 pages, it is circa 700KB vs 230KB).

## 1.2 Basic use

The initial ideology of **mathastext** was to produce mathematical texts with a very uniform look, not separating math from text as strongly as is usually done. As soon as one tries

out other fonts for text than the Computer Modern ones one realizes how extremely “thin” are the default T<sub>E</sub>X fonts for mathematics: they definitely do not fit well visually with the majority of text fonts. With `mathastext` and minimal effort one can get one’s (simple... or not) mathematics typeset in a manner more compatible with the text, without having to look for an especially designed font. Here is a minimal example of what to put in the preamble:

```
\usepackage[T1]{fontenc}
\usepackage{times}
\usepackage[italic]{mathastext}
```

Throughout the entire document, all letters, digits, and punctuation signs inside math mode will then be typeset in Times.<sup>1</sup> Here is the precise list of characters concerned by `mathastext`, all from the basic ASCII set:

`abcdefghijklmnopqrstuvwxyz`  
`ABCDEFGHIJKLMNOPQRSTUVWXYZ`  
`0123456789`  
`! ? * , . : ; + - = ( ) [ ] / # $ % & < > | { } and \`

Missing from the list are the `'` and the `-`. Indeed the prime `'` indicating derivatives is left to its default by `mathastext` as the text font glyph `'` is not, as a rule, a satisfying alternative. Also the minus sign is picked up from the endash character `-`, if available, and not the hyphen character `-`. And nothing is changed to the “large” math symbols, except for  $\prod$  and  $\sum$  in inline math which, like here:  $\prod \sum$ , will be taken from the Symbol Font if option `symbolmisc` was used.

The `italic` option tells the letters to be in italic shape (they will be upright in operator names), as is the standardized habit. However, one should be aware that the built-in placement routines of T<sub>E</sub>X in math mode expect the math italic to have some (tiny) white space around them, so that they don’t “stick” to other symbols, such as a  $\prod$ : compare *if* $\prod$  with a pure math mode *if*  $\prod$ . Compare also (as is done in any book on L<sup>A</sup>T<sub>E</sub>X) the text italic with the math italic (here for Latin Modern):<sup>2</sup>

*abcdefghijklmnopqrstuvwxyz*  
 $abcdefghijklmnopqrstuvwxyz$

Furthermore (and more importantly perhaps) the math parentheses are not the same as the text parentheses, compare *(ab)* (text italic) with  $(ab)$  (math): the math parentheses are upright! Fear not, `mathastext` picks up the parentheses from the upright shape (it can be coerced to do otherwise). Nevertheless sometimes the text parentheses are just not that usable, so there is a package option `noparenthesis`. There are many more options (complete details given further on in this document), let me mention `basic` (do only letters and digits) and `nodigits` (perhaps the old style figures from text do not fit so well in math).

I briefly alluded to the complex spacings in math mode, and it seems indeed to be a complicated affair to construct a math font for T<sub>E</sub>X. When there are thousands of free text fonts and a handful of math ones, if your favorite text font does not mix so well with the available math ones, try out `mathastext`. The following set-up often gives esthetically pleasing results: it is to use the sans-serif member of the font family for math, and the serif for text. This can be done the following way:

<sup>1</sup>let’s do as if we did not know the excellent `txfonts` package which employs Times for text and has a very complete math support, including many additional mathematical glyphs in comparison to the CM fonts.

<sup>2</sup>Text fonts are equipped with ligature rules. The French Cursive font for example has complex ligature rules and they make cohabitation with `mathastext` somewhat difficult in that case.

```

\renewcommand\familydefault\sfdefault
\usepackage{mathastext}
\renewcommand\familydefault\rmdefault
\begin{document}

```

As said already none of the “large” math symbols is modified in any way by `mathastext`. Only loading some math font packages such as `fourier`, `kpfonts`, `mathdesign`, `txfonts`, etc... will change them. Think of loading these packages before `mathastext`, else they might undo what `mathastext` did. An option `symbolmisc` picks up many symbols (arrows for example) from the Symbol font.

There is also the issue of Greek letters. Sometimes the text font has Greek glyphs, in LGR encoding (this will be mentioned in the documentation of the font package). Then option `LGRgreek` tells `mathastext` to pick up these Greek letters. And it is then possible to specify whether the Greek letters should be upright, or “italic”.<sup>3</sup> And if your text font is not distributed with Greek glyphs, and does not mix well with the CM ones then there is always the possibility to load, prior to `mathastext`, some math packages such as `fourier`, `kpfonts`, `mathdesign`, `txfonts`, ...

We specified in our minimal working example a T1 encoding (LY1 would have been ok, too) because the default OT1 does not have the `<>|{}` and `\` glyphs. If `mathastext` detects OT1 as the default encoding it will leave these characters to their defaults from the math fonts (the `subdued` option, described next, acts a bit otherwise, it forces, contrarily to its usual low-key character, the replacement of OT1 by T1 for the fonts ultimately used with letters and digits in math mode.)

The present document illustrated the use of various fonts, so its preamble set-up is accordingly a bit more complicated:<sup>4</sup>

```

\usepackage[T1]{fontenc}
\usepackage[subdued,italic,defaultmathsizes]{mathastext}
\MTDeclareVersion[n]{lmttt}{T1}{lmttt}{m}{n}
\usepackage{newcent}
\Mathastext[newcent]
\usepackage{times}
\Mathastext[times]
\usepackage[scaled]{helvet}
\renewcommand\familydefault\sfdefault
\Mathastext[helvet]
\begin{document}\MTversion{normal}

```

Let us examine this code: it uses once the command `\MTDeclareVersion` and three times the command `\Mathastext`, thus defining four math versions<sup>5</sup>: `lmttt`, `newcent`, `times`, and `helvet`. The names can be taken arbitrarily (they only need to be suitable arguments to the L<sup>A</sup>T<sub>E</sub>X `\DeclareMathVersion` command which is invoked internally, so no spaces in the names). Two additional math versions preexist: the `normal` and `bold`, which, because there was the `subdued` option, were left untouched by `mathastext`.

Once these math versions are defined, `\MTversion{name_of_version}` in the *body* of the document enacts the font switches. As is usual with L<sup>A</sup>T<sub>E</sub>X one can limit the scope to the inside of a group, or also switch back to the main set-up through issuing a `\MTversion{normal}`.

<sup>3</sup>a more detailed discussion comes next. Note that the default CM and its replacement Latin Modern for european languages do both come with LGR encoded fonts.

<sup>4</sup>I have removed the Greek and Symbol font related stuff. See the .dtx source for the real thing.

<sup>5</sup>math versions are discussed in the document `fntguide.pdf` from your T<sub>E</sub>X distribution.

**Important:** the `normal` and `bold` versions are the only ones for which the command `\MTversion` sets up (possibly) different fonts used in text vs math. With all other versions, and also with `normal` and `bold` if the `subdued` option is absent, the `\MTversion` command will set up the same fonts for text and math (letters, digits, and the few other signs listed before).

An optional argument to `\MTversion` allows to specify possibly distinct fonts for text and math: we used in the source of this document `\MTversion[newcent]{helvet}` in order to get New Century Schoolbook for the text and Helvetica for the math. The  $\text{\LaTeX}$  command `\mathversion{name_of_version}` will change only the fonts used in math mode.

### 1.3 The `defaultmathsizes` option

The default sizes give barely legible glyphs (for this author!) for subscripts of subscripts. So `mathastext` makes more reasonable choices. It also redefines `\Huge` and defines a `\HUGE` size, copied from the `moresize` package. To cancel all of this use option `defaultmathsizes`.

### 1.4 The `italic` option

In the initial version 1.0, the Latin letters in mathematical mode assumed the exact same shape as in text mode, and this meant, generally speaking, that they would turn up upright. Doing this gives a very uniform look to the document, so that one has to make an effort and read it with attention, and this was one of the design goals of `mathastext`.

Nevertheless, soon after I posted the initial version of the package to CTAN, I was overwhelmed by numerous<sup>6</sup> questions<sup>7</sup> on how to have the letters be in italic shape.

The default is still, as in version 1.0, for everything to be in upright shape, but it suffices to pass to the package the option `italic` to have the Latin letters in math mode in italic shape.<sup>8</sup> There is also an option `frenchmath` to make the uppercase letters nevertheless upright, because this is the way of traditional French mathematical typography.<sup>9</sup>

### 1.5 The `subdued` option

This option was introduced in v1.15. It provides a manner to switch on the `mathastextification` only for limited portions of the document, with the mechanism of math versions. Without the `subdued` option, the `mathastextification` applies by default to the whole of the document (and one may define additional math versions in the preamble); with the `subdued` option the `mathastextification` has to be activated by an explicit use of a `\MTversion` (also written `\Mathastextversion`) command in the document body, and the document preamble must contain at least one `\Mathastext` command (with the version name in square brackets) to define a math version, to be later used in the body.

What do I do to really mute this annoying `mathastext`? well, you should use additionally to `subdued` the already mentioned option `defaultmathsizes`, and further options which will be explained next: `basic`, `defaultalphabets`, `defaultimath`, `nohbar`. The Greek related options discussed next will not be subdued except for `LGRgreek` and `LGRgreeks`.

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<sup>6</sup>this means “more then one.”

<sup>7</sup>I thank in particular Tariq PERWEZ and Kevin KLEMENT for their kind remarks (chronological order).

<sup>8</sup>more precisely stated, the value of `\itdefault` is used.

<sup>9</sup>more precisely stated, the value of `\shapedefault` is used.

## 1.6 Basic example with math versions

```
\usepackage[T1]{fontenc}
\usepackage{newcent}
\usepackage[subdued]{mathastext}
\Mathastext[newcent]
\renewcommand\familydefault\ttdefault
\Mathastext[courier]
\renewcommand\familydefault\sfdefault
\Mathastext[avantgarde]
\renewcommand\familydefault\rmdefault
\begin{document} stuff and $stuff$ etc\dots
```

The `newcent` package from the `psnfss` standard bundle of L<sup>A</sup>T<sub>E</sub>X font packages sets up New Century Schoolbook (NCS) for the serif font, Avant Garde for the sans font, and Courier for the typewriter font. The command `\usepackage[subdued]{mathastext}` does not change the **normal** math version, but when later invoked through `\MTversion{normal}` it will remember and reset the text font to be New Century Schoolbook. On the other hand `\MTversion{newcent}` is more radical as it sets up the math to also use Schoolbook. Each call to the `\Mathastext` command in the preamble registers the current font family, as given by the current `\familydefault` value. At first `\familydefault` is given as `\rmdefault`, so changing `\rmdefault` is another, indirect, manner to change which font will be associated by **mathastext** to the given version name. Remember though that if `\familydefault` points to some other value, changing `\rmdefault` will not be effective for the `\Mathastext` command. Just before `\begin{document}` we issue a last `\renewcommand` on `\familydefault` if we want the initial font to be used in the text to be roman one, here NCS.

In the body of a document `\MTversion` with a version name does three things:<sup>10</sup> it changes the font for letters, digits, operator names in math mode; it changes the font for text; and it resets the `\(family,rm,sf,tt)defaults` to their values as registered at the time of definition of the version. You may wish to limit its scope to the inside of some group. One may also use the L<sup>A</sup>T<sub>E</sub>X command `\mathversion` in order to only change the fonts in math.

## 1.7 Greek letters

The Computer Modern fonts are very light and thin in comparison to many text fonts, and as a result rarely mix well with them (particularly if the Latin letters in math mode are upright). The following options are provided by **mathastext**:

**no option:** nothing is done by the package, Greek letters are the default Computer Modern ones or have been set-up by other packages; for example by the `fourier` package with option ‘upright’, which gives upright Greek letters.

**LGRgreek:** this is for fonts which additionally to Latin letters also provide Greek letters in LGR encoding. Here is a list from a 2012 standard T<sub>E</sub>X installation: the Computer Modern, Latin Modern, and the CM-LGC fonts; the Greek Font Society fonts (such as GFS Didot), the `epigrafica` and `kerkis` packages, the `txfontsb` package which extends the `txfonts` package with LGR-encoded Greek letters; the Droid fonts, the DejaVu fonts, the `Comfontaa` font, and the Open Sans font. The LGR encoded CM/LM fonts

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<sup>10</sup>well, it also sets up the LGR Greek letters, in case of option **LGRgreek**.

(in serif, sans-serif and typewriter family) give nice Greek letters in upright shape (if you don't use option `italic`, the option `LGRgreek` will use these upright Greek letters if no other package has changed math mode Greek), but those in italic shape are not the same glyphs as the default Greek letters from the OML encoded font `cmmi`, and they are not as nice.

**eulergreek:** the Greek letters will be taken from the Euler font (the document does not have to load the `eulervm` package, `mathastext` directly uses some file included in this package, as it provides a mechanism to scale by an arbitrary factor the Euler font.) The letters are upright.

**symbolgreek:** the Greek letters will be taken from the (Adobe Postscript) Symbol font. A command is provided so that the user can scale the Symbol font to let it better fit with the text font. The letters are upright.

**selfgreek:** this option concerns only the eleven Greek capitals from the OT1-encoding. It does nothing for the lowercase Greek letters. The encoding used in the document does not have to be OT1.

There is also `LGRgreeks` which tells `mathastext` to pick up in each math version the letters from the LGR encoded font used in that version, and `selfGreeks` to tell `mathastext` to do as for `selfgreek` but separately in all math versions.

The `subdued` option will preserve the Greek letters to their defaults in the normal and bold math versions only in the case of the options `LGRgreek/LGRgreeks` (and of course in the case no Greek option was used). **Important:** to maintain Greek letters in normal and bold math to their initial state it is necessary to circumscribe the scope of each call to a `\MTversion{another_version}` to the inside of a group.

## 1.8 Shape of Greek letters

Classic T<sub>E</sub>X uses in math mode italic lowercase and upright uppercase Greek letters. French typography uses upright shape for both lowercase and uppercase. And the ISO standard is to use italic shape for both lowercase and uppercase.

The Euler and Symbol fonts not being available in other than their default upright shape, this question of shapes for Greek letters raises issues only in the case of the options `LGRgreek` and `selfgreek`.

The options `frenchmath`, `itgreek`, `upgreek`, `itGreek` and `upGreek` modify the Greek letter shapes according to the following rules, listed from the lowest to the highest priority:

**no option:** the lowercase Greek letters are in the same shape as Latin letters, and the uppercase in the same shape as applied to digits and operator names,

**frenchmath:** both lowercase and uppercase are in the same shape as the digits and operator names (most of the time this means “upright shape”, but it can be otherwise),

**itgreek, upgreek:** both lowercase and uppercase are in the `\itdefault`, respectively the `\updefault` shape (at the time of loading the package or at the time of a subsequent call to `\Mathastext` or `\MathastextWillUse`),

**itGreek, upGreek:** same as above, but only for the uppercase letters.



So, the default gives the classic T<sub>E</sub>X behavior when option `italic` was passed. Each call to `\Mathastext` (or `\MathastextWillUse`) macros (described in a later section) reinitializes the computation of the shapes.

As mentioned already the package allows to define various “math versions”. In the case of `eulergreek` or `symbolgreek` they apply to all these versions. In the case of the options `LGRgreek`s or `selfGreeks` (notice the additional “s”), each math version is assumed to have its text font available in LGR (or OT1 encoding) and also the shapes will be local to the math version.

Finally version 1.15c of `mathastext` introduces new preamble-only commands to change the shapes, and even the font, used for Greek letters, in case of package options `LGRgreek`/`selfGreek`. They are `\MTitgreek`, `\MTupgreek`, `\MTitGreek`, `\MTupGreek`: these are used like the options and change only the shapes for the math versions which will be declared *next* in the preamble; and `\MTgreekfont{name_of_font}` will tell the *next* math versions to use that font family. To use this command you need to know the (little) name of a suitable font family available in LGR encoding: for example `lmr`, `txr` (needs `txfontsb` package on your system), `DejaVuSerif-TLF` (needs `dejavu` package on your system), etc. . .

## 1.9 Unicode engines

`mathastext` has been made minimally unicode-aware and can be used with XeT<sub>E</sub>X or LuaT<sub>E</sub>X, but the user is strongly advised to look first at the `mathspec` package, which is a far more powerful package designed for unicode.

Of course `mathastext` is extremely far from being able to define a math font, as it applies basically only to a subset of the 32-127 ascii range, and in particular it does not know how to use a given Unicode font simultaneously for Latin and Greek letters. For this the user is strongly advised to look at `mathspec` and `unicode-math`.

When using `mathastext` with either XeT<sub>E</sub>X or LuaT<sub>E</sub>X it is recommended to use the `fontspec` package. Else, some of the encoding dependent things done by `mathastext` like using the en-dash character to get a minus sign in math mode will not be put in place. Furthermore, it is *necessary* to load `fontspec` with its `no-math` option, and this *must* happen before loading `mathastext`.

The `amsmath` package, if used, *must* be loaded before `mathastext`.

Some of the functionality of `mathastext` is less fully realized under the LuaT<sub>E</sub>X engine than it is with XeT<sub>E</sub>X. However this should be visible only under unusual circumstances (in the presence of some other package doing things as crazy as `mathastext` does, the `subdued` option behavior could prove not satisfactory), and will probably be fixed in the future, if the author learns more about LuaT<sub>E</sub>X.

To specify math versions using unicode fonts, use the `fontspec \setmainfont` command (with arbitrary optional features). This command can be issued before loading `mathastext`, or after and then will be followed by a `\Mathastext` command with the name of the version in square brackets. It is possible to mix unicode fonts and classical T<sub>E</sub>X fonts, but due to the handling of the minus sign in math mode (in particular), it is best to have either only unicode fonts, or only old-fashioned T<sub>E</sub>X fonts in a fixed encoding (T1, or LY1 for example).

**Important:** `fontspec` must be loaded with its *no-math* option, and *prior* to `mathastext`.

The package was not extensively tested with unicode engines, but I include here two examples which compiled successfully with XeT<sub>E</sub>X, the first one on a Linux machine, the second one on a Mac OS X machine.

```
\documentclass{article}
\usepackage[hscale=0.8]{geometry}
```



```

\usepackage{multicol}
\usepackage{amsmath}
%\usepackage{mathtools}
\usepackage[no-math]{fontspec}
\usepackage{lmodern}
\usepackage[subdued,italic]{mathastext}
\setmainfont{Andale Mono}
\Mathastext[Andale]
\setmainfont[Color=0000FF]{Arial}
\Mathastext[Arial]
\setmainfont{DejaVu Serif}
\Mathastext[DejaVu]
\MathastextDeclareVersion{times}{T1}{ptm}{m}{n}
\MTlettershape{n}\MTshape{it}
\setmainfont{Verdana}\Mathastext[Verdana]
\begin{document}
\begin{multicols}2
  \centerline{\textbf{math mode}}
\columnbreak
  \centerline{ text }
\end{multicols}
\MTversion{DejaVu} % or any other, as defined in the preamble
\begin{multicols}2
  \centerline{ $abcdefghijklmnopqrstuvwxyz$ }
  \centerline{ $ABCDEFGHIJKLMNOPQRSTUVWXYZ$ }
  \centerline{ $0123456789$ }
  \centerline{ $!\,?\,\backslash,*\,,\backslash,:,\backslash;\,\backslash,+\,\backslash,-\,\backslash,(\,\backslash),\,\backslash,]\,\backslash,/\,\backslash,\#\,\backslash,\%$ }
  \centerline{ $!\,?\,\backslash,*\,,\backslash,:,\backslash;\,\backslash,+\,\backslash,-\,\backslash,(\,\backslash),\,\backslash,]\,\backslash,/\,\backslash,\#\,\backslash,\%$ }
\columnbreak
  \centerline{ abcdefghijklmnopqrstuvwxyz }
  \centerline{ ABCDEFGHIJKLMNOPQRSTUVWXYZ }
  \centerline{ 0123456789 }
  \centerline{ $!\,?\,\backslash,*\,,\backslash,:,\backslash;\,\backslash,+\,\backslash,-\,\backslash,(\,\backslash),\,\backslash,]\,\backslash,/\,\backslash,\#\,\backslash,\%$ }
  \centerline{ $!\,?\,\backslash,*\,,\backslash,:,\backslash;\,\backslash,+\,\backslash,-\,\backslash,(\,\backslash),\,\backslash,]\,\backslash,/\,\backslash,\#\,\backslash,\%$ }
\end{multicols}
(repeat with the other fonts)
\end{document}

```

And now an example with fonts available on Mac OS X:

```

\documentclass{article}
\usepackage[hscale=0.8]{geometry}
\usepackage{multicol}
\usepackage{amsmath}
\usepackage[no-math]{fontspec}
\usepackage[subdued,italic]{mathastext}
\setmainfont{Hoefler Text}\Mathastext[Hoefler]
\setmainfont{Osaka}\Mathastext[Osaka]
\setmainfont{Herculanum}\Mathastext[Herculanum]
\setmainfont{Didot}\Mathastext[Didot]
\setmainfont{Comic Sans MS}\Mathastext[Comic]
\begin{document}
\begin{multicols}2

```



## 2.2 Miscellaneous

**the en-dash as minus sign:** Very often the - character from the text font does not give a good minus sign. So by default, the package uses the en-dash sign –. Use `noendash` to deactivate it. Starting with version 1.12 of the package this ‘en-dash as minus’ should work in all encodings, including Unicode (if `fontspec` has been loaded).

**amsmath:** the behavior of the `\DeclareMathOperator` command of `amsmath` is slightly modified by `mathastext`. This command allows crazy things like

```
\DeclareMathOperator\crazy{m.ch-in'tr/u:c}
```

and then the `.`, `-`, `'`, `/` and `:` will be typeset in the roman font. But the font number was hardcoded in the macro and furthermore the code of `amsmath` would cause an error with Unicode engine as soon as some Unicode code is assigned to the minus character.<sup>11</sup> This specific issue will perhaps be fixed by some hypothetic future release of `amsmath`, or by other packages providing patches, but I decided for a preemptive strike. As a result the declaration above will not cause an error when `\crazy` is used with a Unicode engine, but there are now some spacings around the punctuation characters. To avoid this use (also with  $\text{\LaTeX}$ ):

```
\DeclareMathOperator\crazy{m{.}ch{-}in{'}tr{/}u{:}c}
```

Note though that the `'` will appear as a prime `'`.

**hbar:** The definition of `\hbar` inherited from default  $\text{\LaTeX}$  will in our context make use of the `h` of the current math font (so for us, it is also the text font, perhaps in italic shape), but the bar accross the `h` will come from the original default math font for letters (usually `cmmi`), and furthermore its placement on the `h` can be odd-looking. So we redefine `\hbar` to use only the text font (and this will be aware of the `italic` option). Our construction does not always give an optimal result (and its scope is limited to the `OT1`, `LY1` and `T1` encodings), so an option `nohbar` deactivates it. There is no `\hslash` provided by the package, though. The version 1.12 of the package when dealing with a Unicode font tries to get the `\hbar` directly as a glyph from the font.

**dotless i and j:** By default the package redefines `\i` and `\j` to give the dotless i and j (if it exists at all), *also in math mode*, in the text font. Will overwrite the default commands `\imath` and `\jmath`. In version 1.12 of the package this should work in all encodings, including Unicode (it is then assumed that `fontspec` has been loaded, and of course that the glyphs are indeed in the font).

**XeTeX and LuaTeX:** for the en-dash and the dotless i and j, the package expects to detect either the EU1 encoding for XeTeX or the EU2 encoding for LuaTeX (this will be true if `fontspec` was loaded), or one of `OT1`, `LY1` or `T1`, else it will renounce and not attempt to access the en-dash or the dotless i and j glyphs. With  $\text{\LaTeX}$  and  $\text{Pdf\LaTeX}$ , there is no such limitation and all 8bit-encodings (containing these glyphs) should be ok.

**fontspec:** one more note to users of XeTeX/LuaTeX with `fontspec`: it has to be loaded with the option `no-math`, and before `mathastext`.

---

<sup>11</sup>To the experts: the `sin`, `cos`, ... operator names are *not* defined by `amsmath` with the help of the `\DeclareMathOperator` macro, hence are not the cause of an error in XeTeX/LuaTeX. What `mathastext` does is to let to relax the `\newmcodes@` macro, so it is possible to save it before loading `mathastext` and re-establish later, if really really this is what you want.

**vec accent:** The default `\vec` accent is not appropriate for upright letters, so `mathastext` provides a `\fouriervec` which takes its glyph in a Fourier font, and an Ersatz `\pmvec` which is reasonably good looking on upright letters and works with the `\rightarrow` glyph. Contrarily to version 1.0, the default `\vec` is not overwritten with `\fouriervec`. And contrarily to version 1.1, one now needs to pass the option `fouriervec` to have the math accent `\fouriervec` defined by the package.

**math alphabets:** • We define a new math alphabet command `\mathnormalbold` which gives direct access to the bold version of the `\mathnormal` alphabet (rather than using either the `\bm` command from the `bm` package or the `\boldsymbol` command from the `amsbsy` package).

- The other math alphabet changing commands defined by the package are `\MathEulerBold`, `\MathEuler` and `\MathPSymbol`.
- `\mathnormal`, `\mathrm`, `\mathbf`, `\mathit`, `\mathsf` and `\mathtt` are modified to make reference to the document text fonts (this can be disabled by suitable package options).

Note though that it is not possible to use too many of such commands in the same document, due to some limitations of L<sup>A</sup>T<sub>E</sub>X. Declaring them does not seem to be a problem, and I will welcome any information by knowledgeable people.

**math accents:** an option `mathaccents` is provided to pick up the accents in math mode from the text font, but the package knows only T1, LY1 or OT1-compatible encodings.

Regarding the encoding-dependent glyphs: the en-dash, the dotless i and j, the math accents, the hbar, are encoding dependent and the relevant decisions are made by `mathastext` at the time it is loaded. So you can use math versions with different encodings but, regarding these characters only those with the same encoding as the normal math version will display them correctly.

## 2.3 Commands

### 2.3.1 Preamble-only commands

Nothing is necessary besides loading `mathastext`, possibly with some customizing options. The following commands provide enhancements to the basic use of the package.

- `\Mathastext`: reinitializes `mathastext` according to the current defaults of encoding, family, series and shape.
  - It can also be preceded optionally by one or more of<sup>12</sup> `\MTencoding{<enc>}`, `\MTfamily{<fam>}`, `\MTseries{<ser>}`, `\MTshape{<sh>}`, and, new with version 1.1, `\MTlettershape{<sh>}`. For example valid values are, respectively, `<T1>`, `<phv>`, `<m>`, `<n>`, and `<it>`: this is the Helvetica font in T1-encoding, regular (medium) series, upright shape, and the letters will be in italic shape. Once used their effect applies to all succeeding calls to `\Mathastext`, and can only be undone by using them again.

<sup>12</sup>these commands exist also with long names: `\Mathastextencoding`, etc. . . The same applies to the other commands mentioned in this section.

- **math versions:** starting with version 1.12 `\Mathastext` accepts an optional argument, which will serve as a name to designate the corresponding math version (without optional argument `\Mathastext` redefines the default normal and bold versions.) This argument, being optional, must be enclosed within square brackets.<sup>13</sup>
- `\MTitgreek`, `\MTupgreek`, `\MTitGreek`, `\MTupGreek`: optional commands, active only in the case of the `LGRgreek` option, to decide the shape of the Greek letters in the versions which will be declared next.
- `\MTgreekfont{<fontfamily>}`: optional command with a mandatory argument which specifies the font for Greek letters in all `mathastext` math versions declared afterwards. Only effective with `LGRgreek` option.
- `\MTWillUse[<ltsh>]{<enc>}{<fam>}{<ser>}{<sh>}`: tells `mathastext` to use the font with the specified encoding, family, series, and shape for the letters and digits (and all other afflicted characters) in math mode. The optional argument `<ltsh>` specifies a shape for the letters, for example `\itdefault`, or directly `<it>` or `<sc>`.
- `\MTDeclareVersion[<ltsh>]{<name>}{<enc>}{<fam>}{<ser>}{<sh>}`: declares that the document will have access to the font with the specified characteristics, under the version name `<name>`. For example:  
`\MTDeclareVersion[sc]{palatino}{T1}{ppl}{b}{sl}`  
declares under the name `palatino` a version where mathematics will be typeset using the Palatino font in T1-encoding, bold, slanted, and the letters will in fact be in caps and small caps (and bold).<sup>14</sup> When the optional argument is absent, and `mathastext` was loaded with the `italic` option, then the default letter shape will be `it`,<sup>15</sup> else letters will have the same shape as used for digits and operator-names.
- `\MTboldvariant{<var>}`: when used before `\Mathastext`, specifies which bold (`b`, `sb`, `bx`, ...) to be used by `\mathbf` (and `\boldmath`). Default is the `\bfdefault` at the time of loading `mathastext`. When used before the declaration of a version, decides the way `\mathbf` will act in this version.
- `\MTEulerScale{<factor>}`: scales the Euler font by `<factor>`.
- `\MTSymbolScale{<factor>}`: scales the Symbol font by `<factor>`.

### 2.3.2 Commands to be used in the body

- `\MTVersion[<nametext>]{<namemath>}`:<sup>16</sup> in the absence of the optional argument changes simultaneously the text and the math fonts to be the fonts corresponding to the version `<namemath>`. If there is an optional argument then the text fonts will use `<nametext>` and the math mode will use `<namemath>`. To change only the math fonts, use the `LATEX` command `\mathversion`.

All further commands are for math mode only.

<sup>13</sup>The allowed version names are as for the `LATEX` `\DeclareMathVersion` macro. Do not use “normal” or “bold”; this is already taken care of by a call to `\Mathastext` without optional argument.

<sup>14</sup>I do not especially recommend to use this in real life!

<sup>15</sup>more precisely, the shape is the latest value passed in one of the previously used package commands to specify the shape of letters, or the `\itdefault` of the time of loading the package.

<sup>16</sup>`\MTVersion` is also available as `\MTversion`.

- `\hbar`: this is constructed (in a way compatible with the `italic` option) from the `h` letter and the `ˉ` accent from the `mathastext` font. Note that `\mathrm{\hbar}` and `\mathbf{\hbar}` should work and that `\hbar` does scale in subscripts and exponents. Only for T1 and OT1 (or LY1) encodings.
- `\fouriervec`: this is a `\vec` accent taken from the Fourier font; the `fourier` package need not be loaded. Active only if option `fouriervec`.
- `\pmvec`: this provides a poor man `\vec` accent command, for upright letters. It uses the right arrow. Does not change size in subscripts and exponents.
- `\Mathnormal`, `\Mathrm`, `\Mathbf`, `\Mathit`, `\Mathsf`, `\Mathtt`: modifications of the original `\mathnormal`, `\mathrm`, `\mathbf`, `\mathit`, `\mathsf`, `\mathtt`. By default, the originals are overwritten with the new commands.
- `\mathnormalbold`: a bold version of `\mathnormal`.
- `\inodot`, `\jnodot`: the corresponding glyphs in the chosen font for math mode. By default, will overwrite `\imath` and `\jmath`. With version 1.12 by default `\i` and `\j` work also in math mode and give then `\inodot`, resp. `\jnodot`. This should work for all 8bit-encodings having these glyphs, and also in Unicode.
- `\MathEuler`, `\MathEulerBold`: math alphabets to access all the glyphs of the Euler font, if option `eulergreek` (or `eulerdigits`) was passed to the package.
- `\MathPSymbol`: math alphabet to access the Symbol font.
- when one of the options `symbolgreek`, `eulergreek`, or `selfGreek` is passed to the package the capital Greek letters which look like their Latin counterparts acquire names: `\Digamma`, `\Alpha`, `\Beta`, `\Epsilon`, `\Zeta`, `\Eta`, `\Iota`, `\Kappa`, `\Mu`, `\Nu`, `\Omicron`, `\Rho`, `\Tau`, `\Chi` (no `\Digamma` for Symbol). Also an `\omicron` control sequence is provided.
- LGR Greek and ‘var’-letters: only the `\varsigma` is available in this encoding, so using for example `\varphi` will load the previous default math font. It might thus be suitable when recompiling already written L<sup>A</sup>T<sub>E</sub>X sources to add to the preamble `\let\varphi=\phi`, `\let\ varepsilon=\epsilon`, etc..., in case only the ‘variant’ form of the letter was used in the documents.
- Miscellaneous mathematical symbols from the postscript Symbol font are made available (or replaced) when option `symbolmisc` is passed. They are `\prod`  $\prod$  `\sum`  $\sum$  `\implies`  $\Rightarrow$  `\impliedby`  $\Leftarrow$  `\iff`  $\iff$  `\shortiff`  $\Leftrightarrow$  `\to`  $\rightarrow$  `\longto`  $\longrightarrow$  `\mapsto`  $\mapsto$  `\longmapsto`  $\longmapsto$  `\aleph`  $\aleph$  `\infty`  $\infty$  `\emptyset`  $\emptyset$  `\surd`  $\sqrt{\phantom{x}}$  `\nabla`  $\nabla$  `\angle`  $\angle$  `\forall`  $\forall$  `\exists`  $\exists$  `\neg`  $\neg$  `\clubsuit`  $\clubsuit$  `\diamondsuit`  $\diamondsuit$  `\heartsuit`  $\heartsuit$  `\spadesuit`  $\spadesuit$  `\smallint`  $\int$  `\wedge`  $\wedge$  `\vee`  $\vee$  `\cap`  $\cap$  `\cup`  $\cup$  `\bullet`  $\bullet$  `\div`  $\div$  `\otimes`  $\otimes$  `\oplus`  $\oplus$  `\pm`  $\pm$  `\ast`  $\ast$  `\times`  $\times$  `\propto`  $\propto$  `\mid`  $|$  `\leq`  $\leq$  `\geq`  $\geq$  `\approx`  $\approx$  `\supset`  $\supset$  `\subset`  $\subset$  `\supseteq`  $\supseteq$  `\subseteq`  $\subseteq$  `\in`  $\in$  `\sim`  $\sim$  `\cong`  $\cong$  `\perp`  $\perp$  `\equiv`  $\equiv$  `\notin`  $\notin$  `\langle`  $\langle$  `\rangle`  $\rangle$ . And a `\DotTriangle`  $\therefore$  is made available by option `symbolre` (which overwrites `\Re` and `\Im`:  $\Re$ ,  $\Im$ ). The `\infty` and `\propto` have these names to leave up to the user the choice to replace (or no) the original (larger) `\infty` and `\propto`.

Regarding the `\prod` and `\sum` commands: they will use the Symbol glyphs  $\prod$   $\Sigma$  in inline math, and in display math the Computer Modern ones (or whatever is set up by other packages) :

$$\prod \Sigma$$

The package provides `\prodpsy` and `\sumpsy`: if one really wants in all situations the Symbol glyphs, one can do `\let\prod\prodpsy` and `\let\sum\sumpsy`. Also `\defaultprod` and `\defaultsum` will refer to the `\prod` and `\sum` before redefinition by the package: this is to allow constructs such as `\displaystyle\defaultprod` or `\textstyle\defaultprod`, because they would not work with the `\prod` and `\sum` as re-defined by the package.

## 2.4 Complete list of options

- **basic**: only `mathastextify` letters and digits.
- **subdued**: does not change the default fonts, turns on the `mathastext`-ification only after an explicit `\MTversion` command.
- **italic**: the letters will default to italic shape in math mode.
- **frenchmath**: **italic**, but uppercase Latin letters in the same font as for digits and operator names. In general this means that they will be upright. In case of the **LGRgreek** option, **frenchmath** influences also the shape of the Greek letters.
- **endash**, **emdash**: use the text font en-dash (–) or even the em-dash (—, but this seems crazy) for the minus sign rather than -. **endash** option is default for the package.
- **noendash**: the minus sign will be the - from the text font, not the en-dash –.
- **nohbar**: prevents `mathastext` from defining its own `\hbar`.
- **nolessnomore**: besides `! ? * , . : ; + - = ( ) [ ] / # $ % &` `mathastext` treats also `< > | { }` and `\`. Use this option to not do it. The option **nolessnomore** is activated by default in case of OT1-encoding.
- further excluding options: **noexclam** `! ?` **noasterisk** `*` **nopunctuation** `, . : ;` **noplus**, **nominus**, **noplusnominus** `+ -` **noequal** `=` **noparenthesis** `( ) [ ] /` **nospecials** `# $ % &` and **nodigits**.
- **alldelims**: true by default, means that the characters excluded by **nolessnomore** are treated. Use this option in case of a mono-width OT1-encoded font.
- **symbolgreek**, **symboldigits**: to let Greek letters (digits) use the Symbol font.
- **symbolre**: replaces `\Re` and `\Im` by the Symbol glyphs  $\Re$ ,  $\Im$  and defines a `\DotTriangle` command ( $\dot{\triangle}$ ).
- **symbolmisc**: takes quite a few glyphs, including logical arrows, product and sum signs from Symbol. They are listed *supra*. A `\renewcommand{\int}{\smallint}` will maximize even more the use of the Symbol font.
- **symboldelimiters**: the characters apart from letters and digits will be taken from the Symbol font.



- `symbol`: combines `symbolgreek`, `symbolre`, and `symbolmisc`.
- `symbolmax`: combines `symbol` and `symboldelimiters`.
- `eulergreek`, `eulerdigits`: to let Greek letters (digits) use the Euler font.
- `LGRgreek`: this is for a font which is also available in LGR-encoding. It is possible to change the font per math version, via the use of the `\MTgreekfont` command in the preamble.
- `LGRgreeks`: each declared math version will be supposed to be with a font which is also available in LGR-encoding.
- `selfGreek`: this is for a font which is also available in OT1-encoding and contains the glyphs for the default eleven capital Greek letters.
- `selfGreeks`: each declared math version will be supposed to be with a font with the eleven capital Greek letters in its OT1-encoded version.
- `upgreek`, `itgreek`, `upGreek`, `itGreek`: options to tell to use `\itdefault` or `\updefault` for the lowercase and uppercase (or only the uppercase) Greek letters. Only operant in the case of the `LGRgreek(s)` and `selfGreek(s)` options.
- `mathaccents`: use the text font also for the math accents. As in vanilla L<sup>A</sup>T<sub>E</sub>X, they are taken from the font for the digits and `\log`-like names. Obey the alphabet changing commands. Will work only for T1, LY1, or OT1-compatible encodings.
- `defaultrm`, `defaultbf`, `defaulnormal`, `defaultit`, `defaultsf`, `defaulttt`: do not overwrite, respectively: `\mathrm`, `\mathbf`, `\mathnormal`, `\mathit`, `\mathsf`, and `\mathtt`.
- `defaultalphabets`: do not change any of the math alphabets from the previous item.
- `defaultimath`: do not overwrite `\imath` and `\jmath`, do not extend `\i` and `\j` to math mode use.
- `defaultmathsizes`: do not change the L<sup>A</sup>T<sub>E</sub>X defaults for the sizes of exponents and subscripts.
- `fouriervec`: provides a `\fouriervec` command. The user can then add in the preamble `\let\vec=\fouriervec`. There is also always available a “poor man” vec accent `\pmvec` for upright letters.

Thanks to Kevin KLEMENT, Tariq PERWEZ and Ricard TORRES for sending bug reports and feature requests when the first version of the package was issued.

Numerous examples to be found there:

<http://jf.burnol.free.fr/mathastext.html>  
<http://jf.burnol.free.fr/showcase.html>