Using the *MathTimeProfessional* fonts with LaTeX*

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2004/09/14

Abstract

This document describes the macro package mtpro, which serves for using version 4 of the the *MathTimeProfessional* fonts with LaTeX. The package code was partially adopted from the mathtime package written by Frank Mittelbach and David Carlisle.

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*This document refers to version v4.0 of the mtpro package.

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1 The *MathTimeProfessional* fonts

MathTimeProfessional is a set of math fonts particularly designed for use with TEX or LATEX.

Separate fonts for text size, superscripts, and second order superscripts are provided, allowing quality mathematical typesetting that has hitherto been available only with metal type or with the Computer Modern and the Euler fonts. Furthermore, *MathTimeProfessional* includes individually designed delimiters and roots for sizes up to 4 inches and extra-wide mathematical accents.

With the release of version 2, additional bold and extra-bold math fonts were made available. With version 4, a full upright Greek alphabet was added, as well as additional multiple, line and surface integral signs, additional mathematical symbols and extra-large operator symbols.

2 The mtpro package

Basically, loading the macro package mtpro

```
\usepackage[⟨options⟩]{mtpro}
```

makes LATEX use *MathTimeProfessional* in place of the default Computer Modern math fonts. The following sections describe the particular features of the package and the additional options that control its behavior.

2.1 Text fonts

Loading the mtpro package does not change LATEX's default text font families (Computer Modern). However, the *MathTimeProfessional* fonts were designed to blend best with Times. The Monotype Times New Roman fonts are an ideal match, but mtpro can equally well be used with Adobe Times and similar typefaces, such as Times Ten, and also turns out to work quite well with other text fonts, like Baskerville or Concorde.

The roman, sans-serif and typewriter font families and the encoding of the text fonts are to be selected *before* loading of mtpro (unless you stay with LATEX's defaults), so that the package 'knows' the fonts and the encoding to be used for operator names such as 'sin' and for the math alphabets `\mathrm`, `\mathsf` and `\mathtt`. For instance,

```
\usepackage[T1]{fontenc}
\usepackage{textcomp}
\renewcommand{\rmdefault}{ptm}
\usepackage[scaled=0.92]{helvet}
\usepackage{mtpro}
```

selects T1 encoding with additional text companion symbols and loads *MathTimeProfessional* in conjunction with Adobe Times (`ptm`) and Helvetica, while the default typewriter font family (CM Typewriter) is unchanged. This is how the present document has been typeset.

2.2 Greek letters

With TEX or LATEX, uppercase Greek letters in math mode are usually typeset as upright, even though they are usually meant to designate variables. Since this violates the International Standards ISO31-0:1992 to ISO31-13:1992, the mtpro package provides an option slantedGreek, which causes uppercase Greek (`\Gamma`, `\Delta` etc.), to be typeset as slanted.

Upright lowercase and uppercase Greek letters are available with command names such as `\upalpha`, `\upbeta`, `\upGamma`, `\upDelta`, etc. They are always upright, regardless of the slantedGreek option.

2.3 Numbers and punctuation in math mode

LATEX's default behavior is to typeset numbers and punctuation in math mode using the `\mathrm` alphabet, which normally equals the default text font.

With the mtpro package, in contrast, numerals and punctuation characters are—in math mode—taken from the *MathTimeProfessional* fonts. Thus, entering `$1.23$` will yield a different result than `1.23`, and you will have to decide in each case whether an input fragment is a math or a non-math entity.

2.4 Calligraphic alphabet

The *MathTimeProfessional* fonts do not include a calligraphic alphabet, so `\mathcal` defaults to the calligraphic font of the Computer Modern family. Alternatively, use the calligraphic 'Euler' font by specifying the package option eucal.

Section 3 lists further options to set up `\mathcal` or an additional math alphabet `\mathscr`. They are somewhat confusing and are provided only for the sake of compatibility with the old mathtime package.

2.5 Blackboard Bold

Loading the mtpro package with the option amsbb makes the AMS Symbols B font available as a 'blackboard bold' math alphabet `\mathbb`. Other blackboard bold fonts can be used by loading of appropriate packages, such as mtpams (see section 2.11). In that case, do not select the amsbb option!

2.6 Bold math fonts

2.6.1 Emboldening complete formulas

The declaration `\boldmath` will embolden all formulas within its scope, just as with the standard CM math fonts. Use it, for instance, to emphasize complete formulas or to make sure that mathematical expressions within bold section titles also appear in bold type. Bold formulas should, however, not contain the extra-large parentheses, roots and operators described in section 2.8 below. The `\wide...` accents (2.9) cannot be emboldened, either.

2.6.2 Bold letters and symbols

The declaration `\boldmath` cannot be issued when you are already in math mode. Thus it is not a suitable means to embolden single letters, e.g., if you want to designate vectors with bold type. This use of bold letters in formulas is supported through a number of bold *math alphabets*:

- ▷ `\mathbf` prints its argument using the **bold upright** text font.
- ▷ `\mbf` is similar, but uses a specially modified version of the bold upright Times font, with the spacing and the letter shapes adapted to math typesetting. Thus `\mbf` is appropriate to typeset single variables, while `\mathbf` can be used, e.g., to emphasize an operator name.
- ▷ When the package is loaded with the option boldalphabet, an additional ***bold italic*** math alphabet named `\mathbold` is provided—something that isn't easily available with standard LaTeX. In contrast to `\mathbf` and `\mbf`, this alphabet includes also Greek letters.[1]
- ▷ Beside the usual `\mathcal` there is also a bold variant `\mathbcal`.
- ▷ When a `\mathscr` alphabet is set up through the options lucidascr or mtplusscr, a corresponding bold `\mathbscr` is defined, too.

An *alternative* to the use of several different bold math alphabets is available through the macro package bm. It defines the command `\bm`, which can embolden not only letters but also symbols or arbitrary expressions—provided that the required fonts exist. The command `\bm` should, however, not be used on constructs like `\PARENS` or `\SQRT` or the `\wide...` accents. The package bm belongs to the tools collection, which is part of every LaTeX system. *It is highly recommended to read the documentation of the package before using it!*

2.6.3 'Heavy' symbols

Most—but not all—of the mathematical symbols of the *MathTimeProfessional* fonts exist also in a 'heavy' (i.e., extra-bold) variant, which can be used through the command `\hm` of the above-mentioned package bm.[2] To recognize the existence of the 'heavy' fonts, the package bm must be loaded *after* mtpro!

The 'heavy' symbols are darker and more prominent than the 'bold' ones, so they are suitable, for instance, if you need an extra-bold plus sign with a different mathematical meaning than the regular $+$. Applying `\hm` to characters that are not available as 'heavy' yields either normal type or a 'slug' (a black box), depending on the math alphabet. In particular, this restriction affects Latin and Greek letters, as well as the 'extra-large' delimiters, root, operators and accents described below.

[1] The shape of the uppercase Greek letters follows the slantedGreek option.

[2] Use of the corresponding `\heavymath` declaration is, however, pointless, because the heavy math fonts are incomplete.

2.7 Positioning of subscripts

The appearance of subscripts can be improved by loading the package with the option subscriptcorrection. When certain letters, like f or j, occur as a subscript, the positioning will be automatically adjusted. In the following example, the left sum was typeset with subscript correction, the right one without:

$$C_f + C_j + X_A \qquad C_f + C_j + X_A$$

The `\enablesubscriptcorrection` and `\disablesubscriptcorrection` commands can also be used to turn subscript correction on and off within the document.

No guarantee is made as to the proper functioning of the automatic subscript correction in conjunction with any additional macro package, because the underscore character _ is made active.

2.8 The big differences

2.8.1 Extra-large delimiters and roots

The *MathTimeProfessional* font set includes individually designed parentheses and other delimiters which go up to to 4 inches high.

The large parentheses are produced by the command `\PARENS{...}`; just compare the left matrix with the output obtained from the ordinary `\left(` and `\right(` macros:

$$\left(\begin{array}{ccc} x_{11} & x_{12} & \dots \\ x_{21} & x_{22} & \dots \\ x_{31} & x_{32} & \dots \\ \vdots & \vdots & \ddots \end{array}\right) \qquad \left(\begin{array}{ccc} x_{11} & x_{12} & \dots \\ x_{21} & x_{22} & \dots \\ x_{31} & x_{32} & \dots \\ \vdots & \vdots & \ddots \end{array}\right)$$

Basically, `\PARENS{...}` is just an abbreviation for `\LEFTRIGHT(){...}`. In general, you can use `\LEFTRIGHT` directly with any two delimiters, including the period for an empty delimiter. In addition to parentheses, you can get /, `\backslash`, < (or `\langle`), and > (or `\rangle`), all up to 4 inches high.

A combination like `\LEFTRIGHT(]` is also possible; the] just gets extended in the usual way. At large sizes, however, the (might end up slightly larger than the], since the] grows at the same (6 pt) rate, no matter how large the argument, while the parentheses grow faster for larger formulas. So in such cases it might be desirable to add a 'strut' (i.e. a construction of the form `\rule{0pt}{`⟨*height*⟩`}`) to the formula to force a larger] symbol.

In addition to the `\sqrt` command, which uses an 'extensible' symbol, mtpro provides `\SQRT`, with the same syntax. It produces individually designed root signs up to 4 inches high: In the example below, the left root was typeset using `\SQRT`, the right one results from the ordinary `\sqrt` command.

$$\sqrt[3]{\sum_{i=1}^{n}(y^i - x^i)^3} \qquad \sqrt[3]{\sum_{i=1}^{n}(y^i - x^i)^3}$$

The positioning of the root index can be adjusted through the commands `\LEFTROOT` and `\UPROOT`. They are to be issued in math mode, they are valid inside the current formula only, and they act only on roots produced from `\SQRT`. Positive arguments to these commands will move the root index to the left and up respectively, while a negative argument will move it to the right and down. The units of increment are quite small, which is useful for such adjustments. In the example below, the index β of the left root is moved 2 units to the right and 6 units up by saying `\LEFTROOT{-2} \UPROOT{6} \SQRT...` ; the right root shows the default appearance:

$$\sqrt[\beta]{k} \qquad \sqrt[\beta]{k}$$

Notice that the syntax of the `\LEFTROOT` and `\UPROOT` commands differs both from the amsmath package and from `mtp.tex` !

You can nest `\PARENS` (or `\LEFTRIGHT`), though of course that shouldn't be needed very often. Doing so slows TEX down exponentially and may also exhaust its capacity. It should also be mentioned that `\PARENS` ends up typesetting its argument more than once, in order to find out the right size of the delimiters, so you need to be careful when using boxes: For example, if you have stored a formula in `\box\eqnbox`, then you should be sure to type `\PARENS{\copy\eqnbox}`, rather than `\PARENS{\box\eqnbox}`. The same precaution applies to `\SQRT` and to the new `\wide...` accents explained in section 2.9.

2.8.2 Extra-large operator symbols

In a displayed formula like

$$\sum_{i\notin I} \frac{\int_{-\infty}^{+\infty} f(\alpha_i x)\,dx + 1}{\oint_C f(\beta_i z)\,dz - 1}$$

you might feel the need for a larger sum sign. Normally printers don't provide one, but with the *MathTimeProfessional* fonts you can get an extra-large `\sum` with the `\xl` command. For instance, `\xl{i \notin I}{}\sum...` yields:

$$\sum\limits_{i\notin I} \frac{\int_{-\infty}^{+\infty} f(\alpha_i x)\,dx + 1}{\oint_C f(\beta_i z)\,dz - 1}$$

Notice that the limits are to be given as the first two arguments of `\xl`, rather than as a subscript and superscript to `\sum`. The two arguments *must* appear, even if one, or both, are empty: `{}`.

`\xl` can be applied to all 'large' operators, including those in section 2.10.1. In most cases `\xl` produces a symbol about 18 pt tall. There are also `\XL and \XXL` versions that are 36 pt and 72 pt (a full inch) high! And, heaven forbid, you can even get `\XXXL` versions that are two inches high, thereby assuring yourself (as well as the designer of the MathTime fonts) the lasting enmity of journal editors everywhere.

If you want 'no limits', i.e., if you'd like the limits set as subscripts and superscripts, use the corresponding macros `\xlnl`, `\XLNL` etc. For instance, `\xlnl{a}{b}\int` prints

$$\int_a^b .$$

2.9 Accents in math

In addition to `\widehat` and `\widetilde`, there is now `\widecheck`. The `\widehat`, `\widecheck`, and `\widetilde` accents are extended in a similar fashion as the large delimiters and roots (see above); in each case you can get accents up to 4 inches wide:

$$\widehat{a+b}+\widehat{a+b+c}+\widehat{a+b+c+d}+\widehat{a+b+c+d+e}$$

In a combination like $\hat{A}$, the `\hat` accent might look a little small, while `\widehat` produces an accent $\widehat{A}$ that looks too large. So there is `\what` to produce a slightly wider hat accent, $\what{A}$. Similarly, there are `\wtilde`, `\wcheck`, and `\wbar`.

In addition, there are slightly larger `\wwhat`, `\wwcheck`, `\wwtilde`, and `\wwbar`. The `\wwhat`, `\wwcheck`, and `\wwtilde` accents are identical to the smallest versions of the accents produced by `\widehat` etc., but in some cases it might be preferable to force this smallest size instead of relying on the `\wide...` accents themselves. For example, `\widehat M` yields $\widehat{M}$, because the M (counting the white space on its sides) happens to be just a bit too wide for the smallest `\widehat` accent, whereas `\wwhat M` will result in $\what{M}$.

The `\wwbar` accent is what used to be called `\widebar` in the *MathTime* fonts, but that really wasn't a very good name, since `\overline` is what actually corresponds to the `\wide...` accents.

The standard commands `\dot` and `\ddot` are complemented with ready-made triple and quadruple dot accents `\dddot` and `\ddddot`; they work with or without the amsmath package.

In situations like $\dot{\Gamma}$, the dot accents might look better if they were moved up a bit. So there are `\dotup`, `\ddotup`, `\dddotup` and `\ddddotup`, to produce $\dotup{\Gamma}$, $\ddotup{\Gamma}$ etc.

2.10 Additional symbols not available with standard LaTeX

2.10.1 Integrals

The *MathTimeProfessional* fonts include multiple, surface and line integrals. They are available in text size (as shown in the below table) as well as display size:

$\iint$	`\iint`	$\iiint$	`\iiint`	$\oiint$	`\oiint`	$\oiiint$	`\oiiint`
$\cwoint$	`\cwoint`	$\awoint$	`\awoint`	$\cwint$	`\cwint`		

The macros are compatible with the amsmath package, which may be loaded additionally.

2.10.2 Negated relation symbols

MathTimeProfessional includes a number of ready-made negated relation symbols, which are normally built from pieces. For instance, with *MathTimeProfessional* you should write `\notleq` instead of `\not\leq`. For some of these symbols an alternative name is indicated, which follows the naming scheme of the amssymb package. Symbols, that are marked with an asterisk, do, however, not actually exist in the AMS fonts:

$\not<$	`\notless`, `\nless`	$\not>$	`\notsupset`, `\nsupset`*
$\not\leq$	`\notleq`, `\nleq`	$\not\geq$	`\notsupseteq`, `\nsupseteq`
$\not\prec$	`\notprec`, `\nprec`	$\not\sqsupseteq$	`\notsqsupseteq`, `\nsqsupseteq`*
$\not\preceq$	`\notpreceq`, `\npreceq`	$\neq$	`\neq`
$\not\subset$	`\notsubset`, `\nsubset`*	$\not\equiv$	`\notequiv`
$\not\subseteq$	`\notsubseteq`, `\nsubseteq`	$\not\sim$	`\notsim`
$\not\sqsubseteq$	`\notsqsubseteq`, `\nsqsubseteq`*	$\not\simeq$	`\notsimeq`
$\not>$	`\notgr`, `\ngtr`	$\not\approx$	`\notapprox`
$\not\geq$	`\notgeq`, `\ngeq`	$\not\cong$	`\notcong`, `\ncong`
$\not\succ$	`\notsucc`, `\nsucc`	$\not\asymp$	`\notasymp`
$\not\succeq$	`\notsucceq`, `\nsucceq`		

2.10.3 Miscellaneous symbols

The *MathTimeProfessional* fonts provide various operator symbols and letters, which are not defined with standard LaTeX:

Binary operators

$\barwedge$	`\capprod`	$\barvee$	`\cupprod`
$\circ$	`\comp`	$\diagdown$	`\setdif`

Large operators

$\bigbarwedge$	`\bigcapprod`	$\bigbarvee$	`\bigcupprod`

Letters

$\varbeta$	`\varbeta`	$\upvarbeta$	`\upvarbeta`
∂	`\vardelta`	$\upvardelta$	`\upvardelta`
$\varkappa$	`\varkappa`	$\upvarkappa$	`\upvarkappa`
$\hbar$	`\hslash`	F	`\digamma`
¥	`\yen`		

The above table shows `\bigccapprod` and `\bigcupprod` as they would appear within inline formulas. Being 'large operators', they are enlarged when used within displayed formulas:

$$\bigbarwedge_{i=1}^{n} \alpha_i \qquad \bigbarvee_{i=1}^{n} \alpha_i$$

`\varbeta` and `\vardelta` are old forms of β and δ that you might find useful if you are trying to imitate certain old books. Notice that `\vardelta` is hardly

distinguishable from the `\partial` symbol (the circular portion of `\vardelta` is taller, to match the height of letters like *x* and *o* in math formulas). The only reason for providing `\vardelta` is that all the various Greek alphabets specified for mathematics in the Unicode standard include this variant (perversely called 'partial').

The command `\yen` can be used in text mode, too. In this case the ¥ is taken from the current text font, if it is available there; otherwise, the symbol is taken from the math font.

The bold or heavy versions of ♠ and ♣ are somewhat grotesque. If you need to have different varieties of these, you might like to use the following ones:

♤	`\openspadesuit`	♠	`\shadedspadesuit`
♧	`\openclubsuit`	♣	`\shadedclubsuit`

Notice, however, that the open and shaded symbols themselves have no bold or heavy counterparts!

2.11 Using the AMS symbols and fonts

The basic *MathTimeProfessional* fonts provide already a subset of the AMS symbols, see the above sections 2.10.2 and 2.10.3. To make all of the AMS symbols available with *MathTimeProfessional*, you need to obtain the *MathTimeProfessional* Font Supplement A and use the related macro package mtpams. (The symbol fonts that can be used by loading of the 'standard' packages amsfonts and amssymb, would *not* match the style of *MathTimeProfessional*, and the packages are *not* compatible with mtpro.)

The Euler Fraktur math alphabet can be used through the package eufrak, which is part of the AMS fonts collection; this package *is* compatible with mtpro. Use of the Euler Calligraphic alphabet and of the AMS Blackboard Bold font is already provided within the mtpro package, see the above sections 2.4 and 2.5.

2.12 Change history

Version 4.0 as of 2004-09-14, to be used with version 4 of the fonts:

- additional symbols `\yen`, `\hslash`, `\digamma`
- AMS-like alternative names for negated relation symbols
- `\xl` operators

Version 3.3 as of 2004-05-21, to be used with version 3 of the fonts:

- non-bold upright Greek letters
- additional operator symbols and variant Greek letters
- `\XL`, `\XXL` and `\XXXL` operators.
- additional integrals signs

Version 3.0 as of 2004-01-07, to be used with version 2 of the fonts:

- ▷ The new bold and heavy *MathTimeProfessional* fonts can be used via `\boldmath` or the package bm.
- ▷ Additional math symbols and multiple dot accents are made available.
- ▷ `\mathbold` now acts on uppercase Greek, too, and the shape of the bold uppercase Greek letters follows the slantedGreek option.
- ▷ A full upright Greek alphabet is supported (but the lower-case letters are available only with bold weight).
- ▷ New option eucal to use Euler Script as `\mathcal`. This has a few advantages over using the external package eucal.

Version 2.0.16 as of 2003-12-12:

- ▷ The (undocumented) options OT1, T1, LY1 and noTS1 have been abolished.
- ▷ A new option boldalphabet controls whether the math alphabet command `\mathbold` is made available.

3 Option summary

This section lists all options of the mtpro package. Options that correspond to the default behavior of the package are marked by an asterisk and need normally not to be specified.

uprightGreek* Makes the uppercase Greek letters upright.

slantedGreek Makes the uppercase Greek letters slanted.

subscriptcorrection Redefines the underscore character so that it automatically corrects the spacing of subscripts.

nosubscriptcorrection* Disables the subscript correction.

amsbb Defines `\mathbb` to refer to the blackboard bold math alphabet from the AMS fonts.

boldalphabet Defines `\mathbold` to refer to a bold italic math alphabet.

cmcal* Uses the Computer Modern calligraphic alphabet for `\mathcal` and `\mathbcal`.

eucal Sets up `\mathcal` and `\mathbcal` to use the Euler script fonts.

lucidacal Sets up `\mathcal` and `\mathbcal` to use the Lucida calligraphic fonts

lucidascr Like lucidacal, but puts the fonts into `\mathscr` and `\mathbscr`.

mtplusscr Sets up `\mathscr` and `\mathbscr` to use the MTMS and MTMSB script fonts, which are part of Y&Y's *MathTime* Plus collection.

mtpluscal Like mtplusscr, but puts the fonts into the `\mathcal` and `\mathbcal` alphabets.

This package makes a lot of font re-assignments. Normally these generate warning messages on the terminal, however getting so many messages would be distracting, so a further three options control the font tracing. Even more control may be obtained by loading the tracefnt package.

errorshow* Only show font *errors* on the terminal. Warnings are just sent to the log file.

warningshow Show font warnings on the terminal. This corresponds to the usual LaTeX behavior.

nofontinfo Suppress all font warnings, even from the log file.

NB: Not all options can be used together, e.g., one can at most select one of the options setting up `\mathcal`: If more than one option is given, eucal will win over mtpluscal and lucidacal.
NB: The options lucidascr or mtplusscr must not be used, when an additional package is loaded to set up a `\mathscr` alphabet.

4 The implementation of mtpro

4.1 Options

We start with declaring the options. For the (un)slanted Greek we take `\Gamma` as a marker, since it will be redefined anyway.

```
⟨*mtpro⟩
\DeclareOption{slantedGreek}{\let\Gamma=s}
\DeclareOption{uprightGreek}{\let\Gamma=u}

\newcommand\enablesubscriptcorrection {\catcode`\_=12\relax}
\newcommand\disablesubscriptcorrection{\catcode`\_=8\relax}

\DeclareOption{nosubscriptcorrection}{\disablesubscriptcorrection}
\DeclareOption{subscriptcorrection}  {\enablesubscriptcorrection}
```

We signal that we want Lucida calligraphic by defining `\mathcal` to be the letter `l`. In a similar fashion we handle `\mathscr`.

```
\DeclareOption{cmcal}     {\let\mathcal=c}
\DeclareOption{lucidacal}{\let\mathcal=l}
\DeclareOption{eucal}     {\let\mathcal=e}
\DeclareOption{mtpluscal}{\let\mathcal=s}
\DeclareOption{lucidascr}{\let\mathscr=l}
\DeclareOption{mtplusscr}{\let\mathscr=s}
```

The option boldalphabet controls whether the \mathbold alphabet is made available. Not providing \mathbold saves one math family, and all Greek letters can be declared as type 'mathord', which ensures against constructs such as \mathbf{\alpha} printing garbage.

```
\let\mathbold\@undefined
\DeclareOption{boldalphabet} {\let\mathbold=m}
```

Finally, there is an option for setting up a \mathbb alphabet using the AMS Symbols B font. This is necessary, because the amsfonts package cannot be used in conjunction with mtpro.

```
\DeclareOption{amsbb}{\let\mathbb=y}
```

The option noTS1 is no longer required, but we make sure that it does not cause an error message, if it's still used:

```
\DeclareOption{noTS1}{PackageWarning{mtpro}{%
 The option \CurrentOption\space is no longer required.}}
```

This package makes a lot of redefinitions. The warnings can be rather annoying so some package options control whether the information is printed to the terminal or log file. More control can be obtained by loading the tracefnt package.

Just show font errors; Warning and info to the log file. The default for this package.

```
\DeclareOption{errorshow}{%
   \def\@font@info#1{%
         \GenericInfo{(Font)\@spaces\@spaces\@spaces\space\space}%
                     {LaTeX Font Info: \space\space\space#1}}%
    \def\@font@warning#1{%
         \GenericInfo{(Font)\@spaces\@spaces\@spaces\space\space}%
                        {LaTeX Font Warning: #1}}}
```

The normal LaTeX default, Font Info to the log file and Font Warning to the terminal.

```
\DeclareOption{warningshow}{%
   \def\@font@info#1{%
         \GenericInfo{(Font)\@spaces\@spaces\@spaces\space\space}%
                     {LaTeX Font Info: \space\space\space#1}}%
    \def\@font@warning#1{%
         \GenericWarning{(Font)\@spaces\@spaces\@spaces\space\space}%
                        {LaTeX Font Warning: #1}}}
```

On some machines writing all the log info may slow things down so extra option not to log font changes at all.

```
\DeclareOption{nofontinfo}{%
   \let\@font@info\@gobble
   \let\@font@warning\@gobble}
```

The defaults:

```
\ExecuteOptions{%
 uprightGreek,nosubscriptcorrection,cmcal,errorshow}
\ProcessOptions
```

4.2 Fonts

Switch to `\normalfont`. This makes any—possibly—changed values of em and ex come into effect. (Is this really necessary? In any case, it won't hurt...)

```
\normalfont
```

As the *MathTimeProfessional* fonts come with their private encodings we need to make those encodings known to LaTeX.

```
\DeclareFontEncoding{MPY1}{}{}
\DeclareFontEncoding{MPY2}{}{}
\DeclareFontEncoding{MPY3}{}{}
\DeclareFontSubstitution{MPY1}{mtt}{m}{it}
\DeclareFontSubstitution{MPY2}{mtt}{m}{n}
\DeclareFontSubstitution{MPY3}{mtt}{m}{n}
```

By default there is no 'heavy' mathversion, so let's declare it:

```
\DeclareMathVersion{heavy}
\newcommand\heavymath{\@nomath\heavymath\mathversion{heavy}}
```

The main four symbol fonts:

```
\DeclareSymbolFont{operators}   {\encodingdefault}{\rmdefault}{m}{n}
\DeclareSymbolFont{letters}     {MPY1}{mtt}{m}{it}
\DeclareSymbolFont{symbols}     {MPY2}{mtt}{m}{n}
\DeclareSymbolFont{largesymbols}{MPY3}{mtt}{m}{n}
```

The bold mathversion:

```
\SetSymbolFont{operators}   {bold}{\encodingdefault}{\rmdefault}{b}{n}
\SetSymbolFont{letters}     {bold}{MPY1}{mtt}{b}{it}
\SetSymbolFont{symbols}     {bold}{MPY2}{mtt}{b}{n}
\SetSymbolFont{largesymbols}{bold}{MPY3}{mtt}{b}{n}
```

The 'heavy' mathversion. There are no 'heavy' versions of the 'letters' and 'operators' fonts:

```
\SetSymbolFont{symbols}     {heavy}{MPY2}{mtt}{eb}{n}
\SetSymbolFont{largesymbols}{heavy}{MPY3}{mtt}{eb}{n}
```

The fonts named `\MTEXA@`, `\MTEXE@`, `\MTEXF@` and `\MTEXG@`, are used for the extra-large roots, delimiters and accents. The fonts `\MTXL@` and `\MTXXXL@` provide the extra-large operators. They are to be loaded at 1×, 2×, 3× and 4× `\normalsize`. Notice that we are bypassing the NFSS:

```
\normalsize
\dimen@\f@size pt
\font\MTEXA@=mtexa at \the\dimen@
\font\MTXL@=mtxl at \the\dimen@
\multiply\dimen@\tw@
\font\MTEXE@=mtexe at \the\dimen@
\font\MTXXXL@=mtxxxl at \the\dimen@
\multiply\dimen@\tw@
\font\MTEXF@=mtexf at \the\dimen@
\multiply\dimen@\tw@
\font\MTEXG@=mtexg at \the\dimen@
```

4.3 Math alphabet declarations

4.3.1 The standard alphabets

We don't have to declare `\mathrm` as LaTeX declares it as a math symbol alphabet pointing to 'operators' symbol font. Notice that we let `\mathbf` point to series 'b' rather than 'bf', since Times and similar fonts are usually available with that series.

```
% \DeclareSymbolFontAlphabet{\mathrm}{operators}
\DeclareMathAlphabet{\mathbf}{\encodingdefault}{\rmdefault}{b}{n}
\DeclareMathAlphabet{\mathit}{\encodingdefault}{\rmdefault}{m}{it}
\DeclareMathAlphabet{\mathsf}{\encodingdefault}{\sfdefault}{m}{n}
\DeclareMathAlphabet{\mathtt}{\encodingdefault}{\ttdefault}{m}{n}
\SetMathAlphabet{\mathit}{bold}{\encodingdefault}{\rmdefault}{b}{it}
\SetMathAlphabet{\mathsf}{bold}{\encodingdefault}{\sfdefault}{b}{n}
\SetMathAlphabet{\mathtt}{bold}{\encodingdefault}{\ttdefault}{b}{n}
```

4.3.2 Script alphabets

If the mtplusscr option was selected we make `\mathscr` and `\mathbscr` point to Spivak's script fonts:

```
\ifx\mathscr s
  \let\mathscr\relax
  \DeclareMathAlphabet{\mathscr}       {U}{mtms}{m}{n}
  \SetMathAlphabet    {\mathscr} {bold}{U}{mtms}{b}{n}
  \DeclareMathAlphabet{\mathbscr}      {U}{mtms}{b}{n}
\fi
```

If lucidascr was selected we put the Lucida calligraphic font in `\mathscr`.

```
\ifx\mathscr l
  \let\mathscr\relax
  \DeclareMathAlphabet{\mathscr}  {OMS}{lby}{m}{n}
  \SetMathAlphabet{\mathscr}{bold}{OMS}{lby}{b}{n}
  \DeclareMathAlphabet{\mathbscr} {OMS}{lby}{b}{n}
\fi
```

4.3.3 Calligraphic alphabets

If the `lucidacal` option was selected we set up `\mathcal` to use Lucida:

```
\ifx\mathcal l
  \let\mathcal\relax
  \DeclareMathAlphabet{\mathcal}  {OMS}{lby}{m}{n}
  \SetMathAlphabet{\mathcal}{bold}{OMS}{lby}{b}{n}
  \DeclareMathAlphabet{\mathbcal} {OMS}{lby}{b}{n}
\fi
```

The code below refers to the mtpluscal option:

```
\ifx\mathcal s
  \let\mathcal\relax
  \DeclareMathAlphabet{\mathcal}  {U}{mtms}{m}{n}
  \SetMathAlphabet{\mathcal}{bold}{U}{mtms}{b}{n}
```

```
  \DeclareMathAlphabet{\mathbcal} {U}{mtms}{b}{n}
\fi
```

The option eucal loads Euler Script as `\mathcal`:

```
\ifx\mathcal e
  \let\mathcal\relax
  \DeclareFontFamily{U}{eus}{\skewchar\font'60}
  \DeclareFontShape{U}{eus}{m}{n}{<-7>eusm5<7-9>eusm7<9->eusm10}{}
  \DeclareFontShape{U}{eus}{b}{n}{<-7>eusb5<7-9>eusb7<9->eusb10}{}
  \DeclareMathAlphabet{\mathcal}  {U}{eus}{m}{n}
  \SetMathAlphabet{\mathcal}{bold}{U}{eus}{b}{n}
  \DeclareMathAlphabet{\mathbcal} {U}{eus}{b}{n}
\fi
```

Use CM for `\mathcal`; this is the default behavior, since the CM Calligraphic fonts are always available:

```
\ifx\mathcal c
  \let\mathcal\relax
  \DeclareMathAlphabet{\mathcal}  {OMS}{cmsy}{m}{n}
  \SetMathAlphabet{\mathcal}{bold}{OMS}{cmsy}{b}{n}
  \DeclareMathAlphabet{\mathbcal} {OMS}{cmsy}{b}{n}
\fi
```

4.3.4 Bold math alphabets

We provide a non-standard **bold upright** math alphabet, which points to the MTMBF, MTMBS and MTMBT fonts:

```
\DeclareMathAlphabet{\mbf}{U}{mtt}{b}{n}
```

The ***bold italic*** math alphabet is optional:

```
\ifx\mathbold m
  \let\mathbold\relax
  \DeclareMathAlphabet{\mathbold}{MPY1}{mtt}{b}{it}
\fi
```

NB: Packages such mathpazo, eulervm or fixmath, too, provide a `\mathbold` alphabet.

4.3.5 Blackboard Bold alphabet

Optionally, we set up a 'blackboard bold' alphabet, too.

```
\ifx\mathbb y
  \let\mathbb\relax
  \DeclareFontFamily{U}{msb}{}%
  \DeclareFontShape{U}{msb}{m}{n}{<-7>msbm5<7-9>msbm7<9->msbm10}{}%
  \DeclareMathAlphabet{\mathbb}{U}{msb}{m}{n}
\fi
```

4.4 Math symbol declarations

Definitions which are unchanged from standard LaTeX are commented out.

4.4.1 Existing symbols

All digits and punctuation characters are taken from the ‘letters’ and ‘symbols’ fonts now:

```
\DeclareMathSymbol{0}{\mathalpha}{letters}{"30}
\DeclareMathSymbol{1}{\mathalpha}{letters}{"31}
\DeclareMathSymbol{2}{\mathalpha}{letters}{"32}
\DeclareMathSymbol{3}{\mathalpha}{letters}{"33}
\DeclareMathSymbol{4}{\mathalpha}{letters}{"34}
\DeclareMathSymbol{5}{\mathalpha}{letters}{"35}
\DeclareMathSymbol{6}{\mathalpha}{letters}{"36}
\DeclareMathSymbol{7}{\mathalpha}{letters}{"37}
\DeclareMathSymbol{8}{\mathalpha}{letters}{"38}
\DeclareMathSymbol{9}{\mathalpha}{letters}{"39}
\DeclareMathSymbol{!}{\mathclose}{letters}{"8A}
% \DeclareMathSymbol{*}{\mathbin}{symbols}{"03} % \ast
\DeclareMathSymbol{+}{\mathbin}{symbols}{67}
% \DeclareMathSymbol{,}{\mathpunct}{letters}{"3B}
% \DeclareMathSymbol{-}{\mathbin}{symbols}{"00}
% \DeclareMathSymbol{.}{\mathord}{letters}{"3A}
\DeclareMathSymbol{:}{\mathrel}{symbols}{"57}
\DeclareMathSymbol{;}{\mathpunct}{symbols}{"49}
\DeclareMathSymbol{?}{\mathclose}{letters}{"8B}
\DeclareMathSymbol{=}{\mathrel}{symbols}{"44}
```

All delimiters that are normally taken from the ‘operators’ font are mapped to ‘symbols’ or ‘letters’ now:

```
\DeclareMathDelimiter{(}{\mathopen}{letters}{46}{largesymbols}{0}
\DeclareMathDelimiter{)}{\mathclose}{letters}{47}{largesymbols}{1}
\DeclareMathDelimiter{[}{\mathopen} {letters}{140}{largesymbols}{"02}
\DeclareMathDelimiter{]}{\mathclose}{letters}{141}{largesymbols}{"03}
% \DeclareMathDelimiter{<}{\mathopen}{symbols}{"68}{largesymbols}{"0A}
% \DeclareMathDelimiter{>}{\mathclose}{symbols}{"69}{largesymbols}{"0B}
% \DeclareMathSymbol{<}{\mathrel}{letters}{"3C}
% \DeclareMathSymbol{>}{\mathrel}{letters}{"3E}
\DeclareMathDelimiter{/}{\mathord}{letters}{"3D}{largesymbols}{"0E}
% \DeclareMathSymbol{/}{\mathord}{letters}{"3D}
% \DeclareMathDelimiter{|}{\mathord}{symbols}{"6A}{largesymbols}{"0C}
% \expandafter\DeclareMathDelimiter\@backslashchar
%                           {\mathord}{symbols}{"6E}{largesymbols}{"0F}
```

The lowercase Greek letters must be made `\mathalpha`, if we want `\mathbold` to act on them:

```
\ifx\mathbold\@undefined
% \DeclareMathSymbol{\alpha}{\mathord}{letters}{"0B}
% \DeclareMathSymbol{\beta}{\mathord}{letters}{"0C}
% \DeclareMathSymbol{\gamma}{\mathord}{letters}{"0D}
% \DeclareMathSymbol{\delta}{\mathord}{letters}{"0E}
% \DeclareMathSymbol{\epsilon}{\mathord}{letters}{"0F}
% \DeclareMathSymbol{\zeta}{\mathord}{letters}{"10}
% \DeclareMathSymbol{\eta}{\mathord}{letters}{"11}
% \DeclareMathSymbol{\theta}{\mathord}{letters}{"12}
```

```
% \DeclareMathSymbol{\iota}{\mathord}{letters}{"13}
% \DeclareMathSymbol{\kappa}{\mathord}{letters}{"14}
% \DeclareMathSymbol{\lambda}{\mathord}{letters}{"15}
% \DeclareMathSymbol{\mu}{\mathord}{letters}{"16}
% \DeclareMathSymbol{\nu}{\mathord}{letters}{"17}
% \DeclareMathSymbol{\xi}{\mathord}{letters}{"18}
% \DeclareMathSymbol{\pi}{\mathord}{letters}{"19}
% \DeclareMathSymbol{\rho}{\mathord}{letters}{"1A}
% \DeclareMathSymbol{\sigma}{\mathord}{letters}{"1B}
% \DeclareMathSymbol{\tau}{\mathord}{letters}{"1C}
% \DeclareMathSymbol{\upsilon}{\mathord}{letters}{"1D}
% \DeclareMathSymbol{\phi}{\mathord}{letters}{"1E}
% \DeclareMathSymbol{\chi}{\mathord}{letters}{"1F}
% \DeclareMathSymbol{\psi}{\mathord}{letters}{"20}
% \DeclareMathSymbol{\omega}{\mathord}{letters}{"21}
% \DeclareMathSymbol{\varepsilon}{\mathord}{letters}{"22}
% \DeclareMathSymbol{\vartheta}{\mathord}{letters}{"23}
% \DeclareMathSymbol{\varpi}{\mathord}{letters}{"24}
% \DeclareMathSymbol{\varrho}{\mathord}{letters}{"25}
% \DeclareMathSymbol{\varsigma}{\mathord}{letters}{"26}
% \DeclareMathSymbol{\varphi}{\mathord}{letters}{"27}
  \DeclareMathSymbol{\varkappa}{\mathord}{letters}{126}% new
  \DeclareMathSymbol{\varbeta}{\mathord}{letters}{176} % new
  \DeclareMathSymbol{\vardelta}{\mathord}{letters}{178}% new
\else
  \DeclareMathSymbol{\alpha}{\mathalpha}{letters}{"0B}
  \DeclareMathSymbol{\beta}{\mathalpha}{letters}{"0C}
  \DeclareMathSymbol{\gamma}{\mathalpha}{letters}{"0D}
  \DeclareMathSymbol{\delta}{\mathalpha}{letters}{"0E}
  \DeclareMathSymbol{\epsilon}{\mathalpha}{letters}{"0F}
  \DeclareMathSymbol{\zeta}{\mathalpha}{letters}{"10}
  \DeclareMathSymbol{\eta}{\mathalpha}{letters}{"11}
  \DeclareMathSymbol{\theta}{\mathalpha}{letters}{"12}
  \DeclareMathSymbol{\iota}{\mathalpha}{letters}{"13}
  \DeclareMathSymbol{\kappa}{\mathalpha}{letters}{"14}
  \DeclareMathSymbol{\lambda}{\mathalpha}{letters}{"15}
  \DeclareMathSymbol{\mu}{\mathalpha}{letters}{"16}
  \DeclareMathSymbol{\nu}{\mathalpha}{letters}{"17}
  \DeclareMathSymbol{\xi}{\mathalpha}{letters}{"18}
  \DeclareMathSymbol{\pi}{\mathalpha}{letters}{"19}
  \DeclareMathSymbol{\rho}{\mathalpha}{letters}{"1A}
  \DeclareMathSymbol{\sigma}{\mathalpha}{letters}{"1B}
  \DeclareMathSymbol{\tau}{\mathalpha}{letters}{"1C}
  \DeclareMathSymbol{\upsilon}{\mathalpha}{letters}{"1D}
  \DeclareMathSymbol{\phi}{\mathalpha}{letters}{"1E}
  \DeclareMathSymbol{\chi}{\mathalpha}{letters}{"1F}
  \DeclareMathSymbol{\psi}{\mathalpha}{letters}{"20}
  \DeclareMathSymbol{\omega}{\mathalpha}{letters}{"21}
  \DeclareMathSymbol{\varepsilon}{\mathalpha}{letters}{"22}
  \DeclareMathSymbol{\vartheta}{\mathalpha}{letters}{"23}
  \DeclareMathSymbol{\varpi}{\mathalpha}{letters}{"24}
  \DeclareMathSymbol{\varrho}{\mathalpha}{letters}{"25}
```

```
  \DeclareMathSymbol{\varsigma}{\mathalpha}{letters}{"26}
  \DeclareMathSymbol{\varphi}{\mathalpha}{letters}{"27}
  \DeclareMathSymbol{\varkappa}{\mathalpha}{letters}{126}% new
  \DeclareMathSymbol{\varbeta}{\mathalpha}{letters}{176} % new
  \DeclareMathSymbol{\vardelta}{\mathalpha}{letters}{178}% new
\fi
```

With ordinary LaTeX uppercase Greek is always upright—why? The options uprightGreek and slantedGreek control, how uppercase Greek letters are to appear. This option is also provided with packages such as mathpazo.

By default, the uc Greek letters are made `\mathord`, because they are not available from any other alphabet. However, if the option boldalphabet is selected, we must define them as `\mathalpha`. Let's start with [slantedGreek]:

```
\ifx\Gamma s
  \let\Gamma\@undefined
  \ifx\mathbold\@undefined
    \DeclareMathSymbol{\Gamma}{\mathord}{letters}{"00}
    \DeclareMathSymbol{\Delta}{\mathord}{letters}{"01}
    \DeclareMathSymbol{\Theta}{\mathord}{letters}{"02}
    \DeclareMathSymbol{\Lambda}{\mathord}{letters}{"03}
    \DeclareMathSymbol{\Xi}{\mathord}{letters}{"04}
    \DeclareMathSymbol{\Pi}{\mathord}{letters}{"05}
    \DeclareMathSymbol{\Sigma}{\mathord}{letters}{"06}
    \DeclareMathSymbol{\Upsilon}{\mathord}{letters}{"07}
    \DeclareMathSymbol{\Phi}{\mathord}{letters}{"08}
    \DeclareMathSymbol{\Psi}{\mathord}{letters}{"09}
    \DeclareMathSymbol{\Omega}{\mathord}{letters}{"0A}
  \else
    \DeclareMathSymbol{\Gamma}{\mathalpha}{letters}{"00}
    \DeclareMathSymbol{\Delta}{\mathalpha}{letters}{"01}
    \DeclareMathSymbol{\Theta}{\mathalpha}{letters}{"02}
    \DeclareMathSymbol{\Lambda}{\mathalpha}{letters}{"03}
    \DeclareMathSymbol{\Xi}{\mathalpha}{letters}{"04}
    \DeclareMathSymbol{\Pi}{\mathalpha}{letters}{"05}
    \DeclareMathSymbol{\Sigma}{\mathalpha}{letters}{"06}
    \DeclareMathSymbol{\Upsilon}{\mathalpha}{letters}{"07}
    \DeclareMathSymbol{\Phi}{\mathalpha}{letters}{"08}
    \DeclareMathSymbol{\Psi}{\mathalpha}{letters}{"09}
    \DeclareMathSymbol{\Omega}{\mathalpha}{letters}{"0A}
  \fi
```

The [uprightGreek] variant, which is the default:

```
\else
  \let\Gamma\@undefined
  \ifx\mathbold\@undefined
    \DeclareMathSymbol{\Gamma}{\mathord}{letters}{"80}
    \DeclareMathSymbol{\Delta}{\mathord}{letters}{"81}
    \DeclareMathSymbol{\Theta}{\mathord}{letters}{"82}
    \DeclareMathSymbol{\Lambda}{\mathord}{letters}{"83}
    \DeclareMathSymbol{\Xi}{\mathord}{letters}{"84}
    \DeclareMathSymbol{\Pi}{\mathord}{letters}{"85}
    \DeclareMathSymbol{\Sigma}{\mathord}{letters}{"86}
```

```
    \DeclareMathSymbol{\Upsilon}{\mathord}{letters}{"87}
    \DeclareMathSymbol{\Phi}{\mathord}{letters}{"88}
    \DeclareMathSymbol{\Psi}{\mathord}{letters}{"89}
    \DeclareMathSymbol{\Omega}{\mathord}{letters}{"7F}
  \else
    \DeclareMathSymbol{\Gamma}{\mathalpha}{letters}{"80}
    \DeclareMathSymbol{\Delta}{\mathalpha}{letters}{"81}
    \DeclareMathSymbol{\Theta}{\mathalpha}{letters}{"82}
    \DeclareMathSymbol{\Lambda}{\mathalpha}{letters}{"83}
    \DeclareMathSymbol{\Xi}{\mathalpha}{letters}{"84}
    \DeclareMathSymbol{\Pi}{\mathalpha}{letters}{"85}
    \DeclareMathSymbol{\Sigma}{\mathalpha}{letters}{"86}
    \DeclareMathSymbol{\Upsilon}{\mathalpha}{letters}{"87}
    \DeclareMathSymbol{\Phi}{\mathalpha}{letters}{"88}
    \DeclareMathSymbol{\Psi}{\mathalpha}{letters}{"89}
    \DeclareMathSymbol{\Omega}{\mathalpha}{letters}{"7F}
  \fi
\fi
```

The slanted uppercase Greek letters are made available with alternative names, too. Notice that these are undocumented:

```
\DeclareMathSymbol{\varGamma}{\mathord}{letters}{"00}
\DeclareMathSymbol{\varDelta}{\mathord}{letters}{"01}
\DeclareMathSymbol{\varTheta}{\mathord}{letters}{"02}
\DeclareMathSymbol{\varLambda}{\mathord}{letters}{"03}
\DeclareMathSymbol{\varXi}{\mathord}{letters}{"04}
\DeclareMathSymbol{\varPi}{\mathord}{letters}{"05}
\DeclareMathSymbol{\varSigma}{\mathord}{letters}{"06}
\DeclareMathSymbol{\varUpsilon}{\mathord}{letters}{"07}
\DeclareMathSymbol{\varPhi}{\mathord}{letters}{"08}
\DeclareMathSymbol{\varPsi}{\mathord}{letters}{"09}
\DeclareMathSymbol{\varOmega}{\mathord}{letters}{"0A}
```

The following Greek letters are always upright.

```
\DeclareMathSymbol{\upGamma}{\mathord}{letters}{"80}
\DeclareMathSymbol{\upDelta}{\mathord}{letters}{"81}
\DeclareMathSymbol{\upTheta}{\mathord}{letters}{"82}
\DeclareMathSymbol{\upLambda}{\mathord}{letters}{"83}
\DeclareMathSymbol{\upXi}{\mathord}{letters}{"84}
\DeclareMathSymbol{\upPi}{\mathord}{letters}{"85}
\DeclareMathSymbol{\upSigma}{\mathord}{letters}{"86}
\DeclareMathSymbol{\upUpsilon}{\mathord}{letters}{"87}
\DeclareMathSymbol{\upPhi}{\mathord}{letters}{"88}
\DeclareMathSymbol{\upPsi}{\mathord}{letters}{"89}
\DeclareMathSymbol{\upOmega}{\mathord}{letters}{"7F}
\DeclareMathSymbol{\upalpha}{\mathord}{letters}{"92}
\DeclareMathSymbol{\upbeta}{\mathord}{letters}{"93}
\DeclareMathSymbol{\upgamma}{\mathord}{letters}{"94}
\DeclareMathSymbol{\updelta}{\mathord}{letters}{"95}
\DeclareMathSymbol{\upepsilon}{\mathord}{letters}{"96}
\DeclareMathSymbol{\upzeta}{\mathord}{letters}{"97}
\DeclareMathSymbol{\upeta}{\mathord}{letters}{"98}
\DeclareMathSymbol{\uptheta}{\mathord}{letters}{"99}
```

```
\DeclareMathSymbol{\upiota}{\mathord}{letters}{"9A}
\DeclareMathSymbol{\upkappa}{\mathord}{letters}{"9B}
\DeclareMathSymbol{\uplambda}{\mathord}{letters}{"9C}
\DeclareMathSymbol{\upmu}{\mathord}{letters}{"9D}
\DeclareMathSymbol{\upnu}{\mathord}{letters}{"9E}
\DeclareMathSymbol{\upxi}{\mathord}{letters}{"9F}
\DeclareMathSymbol{\uppi}{\mathord}{letters}{160}
\DeclareMathSymbol{\uprho}{\mathord}{letters}{161}
\DeclareMathSymbol{\upsigma}{\mathord}{letters}{162}
\DeclareMathSymbol{\uptau}{\mathord}{letters}{163}
\DeclareMathSymbol{\upupsilon}{\mathord}{letters}{164}
\DeclareMathSymbol{\upphi}{\mathord}{letters}{165}
\DeclareMathSymbol{\upchi}{\mathord}{letters}{166}
\DeclareMathSymbol{\uppsi}{\mathord}{letters}{167}
\DeclareMathSymbol{\upomega}{\mathord}{letters}{168}
\DeclareMathSymbol{\upvarepsilon}{\mathord}{letters}{169}
\DeclareMathSymbol{\upvartheta}{\mathord}{letters}{170}
\DeclareMathSymbol{\upvarpi}{\mathord}{letters}{171}
\DeclareMathSymbol{\upvarrho}{\mathord}{letters}{172}
\DeclareMathSymbol{\upvarsigma}{\mathord}{letters}{173}
\DeclareMathSymbol{\upvarphi}{\mathord}{letters}{174}
\DeclareMathSymbol{\upvarkappa}{\mathord}{letters}{175}
\DeclareMathSymbol{\upvarbeta}{\mathord}{letters}{177}
\DeclareMathSymbol{\upvardelta}{\mathord}{letters}{179}
```

We continue with standard symbols:

```
% \DeclareMathSymbol{\aleph}{\mathord}{symbols}{"40}
% \DeclareMathSymbol{\imath}{\mathord}{letters}{"7B}
% \DeclareMathSymbol{\jmath}{\mathord}{letters}{"7C}
% \DeclareMathSymbol{\ell}{\mathord}{letters}{"60}
% \DeclareMathSymbol{\wp}{\mathord}{letters}{"7D}
% \DeclareMathSymbol{\Re}{\mathord}{symbols}{"3C}
% \DeclareMathSymbol{\Im}{\mathord}{symbols}{"3D}
% \DeclareMathSymbol{\partial}{\mathord}{letters}{"40}
% \DeclareMathSymbol{\infty}{\mathord}{symbols}{"31}
% \DeclareMathSymbol{\prime}{\mathord}{symbols}{"30}
% \DeclareMathSymbol{\emptyset}{\mathord}{symbols}{"3B}
% \DeclareMathSymbol{\nabla}{\mathord}{symbols}{"72}
% \def\surd{{\mathchar"1270}}
% \DeclareMathSymbol{\top}{\mathord}{symbols}{"3E}
% \DeclareMathSymbol{\bot}{\mathord}{symbols}{"3F}
% \DeclareMathSymbol{\triangle}{\mathord}{symbols}{"34}
% \DeclareMathSymbol{\forall}{\mathord}{symbols}{"38}
% \DeclareMathSymbol{\exists}{\mathord}{symbols}{"39}
% \DeclareMathSymbol{\neg}{\mathord}{symbols}{"3A}
%     \let\lnot=\neg
% \DeclareMathSymbol{\flat}{\mathord}{letters}{"5B}
% \DeclareMathSymbol{\natural}{\mathord}{letters}{"5C}
% \DeclareMathSymbol{\sharp}{\mathord}{letters}{"5D}
% \DeclareMathSymbol{\clubsuit}{\mathord}{symbols}{"7C}
% \DeclareMathSymbol{\diamondsuit}{\mathord}{symbols}{"7D}
% \DeclareMathSymbol{\heartsuit}{\mathord}{symbols}{"7E}
```

```
% \DeclareMathSymbol{\spadesuit}{\mathord}{symbols}{"7F}
% \DeclareMathSymbol{\coprod}{\mathop}{largesymbols}{"60}
% \DeclareMathSymbol{\bigvee}{\mathop}{largesymbols}{"57}
% \DeclareMathSymbol{\bigwedge}{\mathop}{largesymbols}{"56}
% \DeclareMathSymbol{\biguplus}{\mathop}{largesymbols}{"55}
% \DeclareMathSymbol{\bigcap}{\mathop}{largesymbols}{"54}
% \DeclareMathSymbol{\bigcup}{\mathop}{largesymbols}{"53}
% \DeclareMathSymbol{\intop}{\mathop}{largesymbols}{"52}
%     \def\int{\intop\nolimits}
% \DeclareMathSymbol{\prod}{\mathop}{largesymbols}{"51}
% \DeclareMathSymbol{\sum}{\mathop}{largesymbols}{"50}
% \DeclareMathSymbol{\bigotimes}{\mathop}{largesymbols}{"4E}
% \DeclareMathSymbol{\bigoplus}{\mathop}{largesymbols}{"4C}
% \DeclareMathSymbol{\bigodot}{\mathop}{largesymbols}{"4A}
% \DeclareMathSymbol{\ointop}{\mathop}{largesymbols}{"48}
%     \def\oint{\ointop\nolimits}
% \DeclareMathSymbol{\bigsqcup}{\mathop}{largesymbols}{"46}
% \DeclareMathSymbol{\smallint}{\mathop}{symbols}{"73}
\DeclareMathSymbol{\triangleleft}{\mathbin}{symbols}{"47}
\DeclareMathSymbol{\triangleright}{\mathbin}{symbols}{"46}
% \DeclareMathSymbol{\bigtriangleup}{\mathbin}{symbols}{"34}
% \DeclareMathSymbol{\bigtriangledown}{\mathbin}{symbols}{"35}
% \DeclareMathSymbol{\wedge}{\mathbin}{symbols}{"5E}
%    \let\land=\wedge
% \DeclareMathSymbol{\vee}{\mathbin}{symbols}{"5F}
%    \let\lor=\vee
% \DeclareMathSymbol{\cap}{\mathbin}{symbols}{"5C}
% \DeclareMathSymbol{\cup}{\mathbin}{symbols}{"5B}
\DeclareMathSymbol{\ddagger}{\mathbin}{letters}{"8F}
\DeclareMathSymbol{\dagger}{\mathbin}{letters}{"8E}
% \DeclareMathSymbol{\sqcap}{\mathbin}{symbols}{"75}
% \DeclareMathSymbol{\sqcup}{\mathbin}{symbols}{"74}
% \DeclareMathSymbol{\uplus}{\mathbin}{symbols}{"5D}
% \DeclareMathSymbol{\amalg}{\mathbin}{symbols}{"71}
% \DeclareMathSymbol{\diamond}{\mathbin}{symbols}{"05}
% \DeclareMathSymbol{\bullet}{\mathbin}{symbols}{"0F}
% \DeclareMathSymbol{\wr}{\mathbin}{symbols}{"6F}
% \DeclareMathSymbol{\div}{\mathbin}{symbols}{"04}
% \DeclareMathSymbol{\odot}{\mathbin}{symbols}{"0C}
% \DeclareMathSymbol{\oslash}{\mathbin}{symbols}{"0B}
% \DeclareMathSymbol{\otimes}{\mathbin}{symbols}{"0A}
% \DeclareMathSymbol{\ominus}{\mathbin}{symbols}{"09}
% \DeclareMathSymbol{\oplus}{\mathbin}{symbols}{"08}
% \DeclareMathSymbol{\mp}{\mathbin}{symbols}{"07}
% \DeclareMathSymbol{\pm}{\mathbin}{symbols}{"06}
% \DeclareMathSymbol{\circ}{\mathbin}{symbols}{"0E}
% \DeclareMathSymbol{\bigcirc}{\mathbin}{symbols}{"0D}
% \DeclareMathSymbol{\setminus}{\mathbin}{symbols}{"6E}
% \DeclareMathSymbol{\cdot}{\mathbin}{symbols}{"01}
% \DeclareMathSymbol{\ast}{\mathbin}{symbols}{"03}
% \DeclareMathSymbol{\times}{\mathbin}{symbols}{"02}
% \DeclareMathSymbol{\star}{\mathbin}{letters}{"3F}
```

```
% \DeclareMathSymbol{\propto}{\mathrel}{symbols}{"2F}
% \DeclareMathSymbol{\sqsubseteq}{\mathrel}{symbols}{"76}
% \DeclareMathSymbol{\sqsupseteq}{\mathrel}{symbols}{"77}
% \DeclareMathSymbol{\parallel}{\mathrel}{symbols}{"6B}
% \DeclareMathSymbol{\mid}{\mathrel}{symbols}{"6A}
% \DeclareMathSymbol{\dashv}{\mathrel}{symbols}{"61}
% \DeclareMathSymbol{\vdash}{\mathrel}{symbols}{"60}
% \DeclareMathSymbol{\nearrow}{\mathrel}{symbols}{"25}
% \DeclareMathSymbol{\searrow}{\mathrel}{symbols}{"26}
% \DeclareMathSymbol{\nwarrow}{\mathrel}{symbols}{"2D}
% \DeclareMathSymbol{\swarrow}{\mathrel}{symbols}{"2E}
% \DeclareMathSymbol{\Leftrightarrow}{\mathrel}{symbols}{"2C}
% \DeclareMathSymbol{\Leftarrow}{\mathrel}{symbols}{"28}
% \DeclareMathSymbol{\Rightarrow}{\mathrel}{symbols}{"29}
% \def\neq{\not=} \let\ne=\neq
% \DeclareMathSymbol{\leq}{\mathrel}{symbols}{"14}
%    \let\le=\leq
% \DeclareMathSymbol{\geq}{\mathrel}{symbols}{"15}
%    \let\ge=\geq
% \DeclareMathSymbol{\succ}{\mathrel}{symbols}{"1F}
% \DeclareMathSymbol{\prec}{\mathrel}{symbols}{"1E}
% \DeclareMathSymbol{\approx}{\mathrel}{symbols}{"19}
% \DeclareMathSymbol{\succeq}{\mathrel}{symbols}{"17}
% \DeclareMathSymbol{\preceq}{\mathrel}{symbols}{"16}
% \DeclareMathSymbol{\supset}{\mathrel}{symbols}{"1B}
% \DeclareMathSymbol{\subset}{\mathrel}{symbols}{"1A}
% \DeclareMathSymbol{\supseteq}{\mathrel}{symbols}{"13}
% \DeclareMathSymbol{\subseteq}{\mathrel}{symbols}{"12}
% \DeclareMathSymbol{\in}{\mathrel}{symbols}{"32}
% \DeclareMathSymbol{\ni}{\mathrel}{symbols}{"33}
%     \let\owns=\ni
% \DeclareMathSymbol{\gg}{\mathrel}{symbols}{"1D}
% \DeclareMathSymbol{\ll}{\mathrel}{symbols}{"1C}
% \DeclareMathSymbol{\not}{\mathrel}{symbols}{"36}
% \DeclareMathSymbol{\leftrightarrow}{\mathrel}{symbols}{"24}
% \DeclareMathSymbol{\leftarrow}{\mathrel}{symbols}{"20}
%    \let\gets=\leftarrow
% \DeclareMathSymbol{\rightarrow}{\mathrel}{symbols}{"21}
%    \let\to=\rightarrow
% \DeclareMathSymbol{\mapstochar}{\mathrel}{symbols}{"37}
% \DeclareMathSymbol{\sim}{\mathrel}{symbols}{"18}
% \DeclareMathSymbol{\simeq}{\mathrel}{symbols}{"27}
% \DeclareMathSymbol{\perp}{\mathrel}{symbols}{"3F}
% \DeclareMathSymbol{\equiv}{\mathrel}{symbols}{"11}
% \DeclareMathSymbol{\asymp}{\mathrel}{symbols}{"10}
% \DeclareMathSymbol{\smile}{\mathrel}{letters}{"5E}
% \DeclareMathSymbol{\frown}{\mathrel}{letters}{"5F}
% \DeclareMathSymbol{\leftharpoonup}{\mathrel}{letters}{"28}
% \DeclareMathSymbol{\leftharpoondown}{\mathrel}{letters}{"29}
% \DeclareMathSymbol{\rightharpoonup}{\mathrel}{letters}{"2A}
% \DeclareMathSymbol{\rightharpoondown}{\mathrel}{letters}{"2B}
% \def\doteq{\buildrel\textstyle.\over=}
```

```
% \def\joinrel{\mathrel{\mkern-3mu}}
% \def\relbar{\mathrel{\smash-}}
\let\Relbar\@undefined
\DeclareMathSymbol{\Relbar}{\mathrel}{symbols}{"48}
% \DeclareMathSymbol{\lhook}{\mathrel}{letters}{"2C}
%    \def\hookrightarrow{\lhook\joinrel\rightarrow}
% \DeclareMathSymbol{\rhook}{\mathrel}{letters}{"2D}
%    \def\hookleftarrow{\leftarrow\joinrel\rhook}
% \def\bowtie{\mathrel\triangleright\joinrel\mathrel\triangleleft}
% \def\models{\mathrel{|}\joinrel\Relbar}
% \def\Longrightarrow{\Relbar\joinrel\Rightarrow}
% \DeclareRobustCommand\longrightarrow
%      {\relbar\joinrel\rightarrow}
% \DeclareRobustCommand\longleftarrow
%      {\leftarrow\joinrel\relbar}
% \def\Longleftarrow{\Leftarrow\joinrel\Relbar}
% \def\longmapsto{\mapstochar\longrightarrow}
% \def\longleftrightarrow{\leftarrow\joinrel\rightarrow}
% \def\Longleftrightarrow{\Leftarrow\joinrel\Rightarrow}
% \def\iff{\;\Longleftrightarrow\;}
\DeclareMathSymbol{\ldotp}{\mathpunct}{letters}{"3A}
% \DeclareMathSymbol{\cdotp}{\mathpunct}{symbols}{"01}
\let\colon\@undefined % for amsmath!
\DeclareMathSymbol{\colon}{\mathpunct}{symbols}{"57}
% \def\cdots{\mathinner{\cdotp\cdotp\cdotp}}
```

Improved definitions of the commands `\vdots` and `\ddots` are adapted from mathtime. They take their dots always from the math font, rather than from a text font. If the package mathdots was loaded before, we skip the redefinitions, since that package provides a much more comprehensive solution.

```
\@ifpackageloaded{mathdots}{}{%
  \newcommand\hb@xmdot{\hbox{$\m@th.$}}
  \def\vdots{\vbox{\baselineskip4\p@ \lineskiplimit\z@
    \kern6\p@\hb@xmdot\hb@xmdot\hb@xmdot}}
  \def\ddots{\mathinner{\mkern1mu\raise7\p@\vbox{\kern7\p@
    \hb@xmdot}\mkern2mu
    \raise4\p@\hb@xmdot\mkern2mu\raise\p@\hb@xmdot\mkern1mu}}
}
```

We make all accents `\mathord`; as they are placed in strange positions it is really not feasible to support changing them.

```
\DeclareMathAccent{\vec}{\mathord}{symbols}{69}
\DeclareMathAccent{\grave}{\mathord}{symbols}{74}
\DeclareMathAccent{\acute}{\mathord}{symbols}{75}
\DeclareMathAccent{\check}{\mathord}{symbols}{76}
\DeclareMathAccent{\breve}{\mathord}{symbols}{77}
\DeclareMathAccent{\bar}{\mathord}{symbols}{78}
\DeclareMathAccent{\hat}{\mathord}{symbols}{79}
\DeclareMathAccent{\dot}{\mathord}{symbols}{80}
\DeclareMathAccent{\tilde}{\mathord}{symbols}{81}
\DeclareMathAccent{\ddot}{\mathord}{symbols}{82}
\DeclareMathAccent{\mathring}{\mathord}{symbols}{86}
```

The wide math accents will later be defined as macros:

```
% \DeclareMathAccent{\widetilde}{\mathord}{largesymbols}{"65}
% \DeclareMathAccent{\widehat}{\mathord}{largesymbols}{"62}

% \DeclareMathRadical{\sqrtsign}{symbols}{"70}{largesymbols}{"70}
% \def\overrightarrow#1{\vbox{\m@th\ialign{##\crcr
%       \rightarrowfill\crcr\noalign{\kern-\p@\nointerlineskip}
%       $\hfil\displaystyle{#1}\hfil$\crcr}}}
% \def\overleftarrow#1{\vbox{\m@th\ialign{##\crcr
%       \leftarrowfill\crcr\noalign{\kern-\p@\nointerlineskip}%
%       $\hfil\displaystyle{#1}\hfil$\crcr}}}
% \def\overbrace#1{\mathop{\vbox{\m@th\ialign{##\crcr\noalign{\kern3\p@}%
%       \downbracefill\crcr\noalign{\kern3\p@\nointerlineskip}%
%       $\hfil\displaystyle{#1}\hfil$\crcr}}}\limits}
% \def\underbrace#1{\mathop{\vtop{\m@th\ialign{##\crcr
%    $\hfil\displaystyle{#1}\hfil$\crcr
%    \noalign{\kern3\p@\nointerlineskip}%
%    \upbracefill\crcr\noalign{\kern3\p@}}}}\limits}
% \def\skew#1#2#3{{\muskip\z@#1mu\divide\muskip\z@\tw@ \mkern\muskip\z@
%     #2{\mkern-\muskip\z@{#3}\mkern\muskip\z@}\mkern-\muskip\z@}{}}
% \def\rightarrowfill{$\m@th\smash-\mkern-7mu%
%   \cleaders\hbox{$\mkern-2mu\smash-\mkern-2mu$}\hfill
%   \mkern-7mu\mathord\rightarrow$}
% \def\leftarrowfill{$\m@th\mathord\leftarrow\mkern-7mu%
%   \cleaders\hbox{$\mkern-2mu\smash-\mkern-2mu$}\hfill
%   \mkern-7mu\smash-$}

\DeclareMathSymbol{\braceld}{\mathord}{largesymbols}{"82}
\DeclareMathSymbol{\bracerd}{\mathord}{largesymbols}{"83}
\DeclareMathSymbol{\bracelu}{\mathord}{largesymbols}{"84}
\DeclareMathSymbol{\braceru}{\mathord}{largesymbols}{"85}
% \def\downbracefill{$\m@th \setbox\z@\hbox{$\braceld$}%
%   \braceld\leaders\vrule \@height\ht\z@ \@depth\z@\hfill\braceru
%   \bracelu\leaders\vrule \@height\ht\z@ \@depth\z@\hfill\bracerd$}
% \def\upbracefill{$\m@th \setbox\z@\hbox{$\braceld$}%
%   \bracelu\leaders\vrule \@height\ht\z@ \@depth\z@\hfill\bracerd
%   \braceld\leaders\vrule \@height\ht\z@ \@depth\z@\hfill\braceru$}
% \DeclareMathDelimiter{\lmoustache}   % top from (, bottom from )
%    {\mathopen}{largesymbols}{"7A}{largesymbols}{"40}
% \DeclareMathDelimiter{\rmoustache}   % top from ), bottom from (
%    {\mathclose}{largesymbols}{"7B}{largesymbols}{"41}
% \DeclareMathDelimiter{\arrowvert}    % arrow without arrowheads
%    {\mathord}{symbols}{"6A}{largesymbols}{"3C}
% \DeclareMathDelimiter{\Arrowvert}    % double arrow without arrowheads
%    {\mathord}{symbols}{"6B}{largesymbols}{"3D}
% \DeclareMathDelimiter{\Vert}
%    {\mathord}{symbols}{"6B}{largesymbols}{"0D}
% \let\|=\Vert
% \DeclareMathDelimiter{\vert}
%    {\mathord}{symbols}{"6A}{largesymbols}{"0C}
% \DeclareMathDelimiter{\uparrow}
%    {\mathrel}{symbols}{"22}{largesymbols}{"78}
% \DeclareMathDelimiter{\downarrow}
```

```
%    {\mathrel}{symbols}{"23}{largesymbols}{"79}
% \DeclareMathDelimiter{\updownarrow}
%    {\mathrel}{symbols}{"6C}{largesymbols}{"3F}
% \DeclareMathDelimiter{\Uparrow}
%    {\mathrel}{symbols}{"2A}{largesymbols}{"7E}
% \DeclareMathDelimiter{\Downarrow}
%    {\mathrel}{symbols}{"2B}{largesymbols}{"7F}
% \DeclareMathDelimiter{\Updownarrow}
%    {\mathrel}{symbols}{"6D}{largesymbols}{"77}
% \DeclareMathDelimiter{\backslash}    % for double coset G\backslash H
%    {\mathord}{symbols}{"6E}{largesymbols}{"0F}
% \DeclareMathDelimiter{\rangle}
%    {\mathclose}{symbols}{"69}{largesymbols}{"0B}
% \DeclareMathDelimiter{\langle}
%    {\mathopen}{symbols}{"68}{largesymbols}{"0A}
% \DeclareMathDelimiter{\rbrace}
%   {\mathclose}{symbols}{"67}{largesymbols}{"09}
% \DeclareMathDelimiter{\lbrace}
%    {\mathopen}{symbols}{"66}{largesymbols}{"08}
% \DeclareMathDelimiter{\rceil}
%    {\mathclose}{symbols}{"65}{largesymbols}{"07}
% \DeclareMathDelimiter{\lceil}
%    {\mathopen}{symbols}{"64}{largesymbols}{"06}
% \DeclareMathDelimiter{\rfloor}
%    {\mathclose}{symbols}{"63}{largesymbols}{"05}
% \DeclareMathDelimiter{\lfloor}
%    {\mathopen}{symbols}{"62}{largesymbols}{"04}
% \DeclareMathDelimiter{\lgroup} % extensible ( with sharper tips
%      {\mathopen}{largesymbols}{"3A}{largesymbols}{"3A}
% \DeclareMathDelimiter{\rgroup} % extensible ) with sharper tips
%      {\mathclose}{largesymbols}{"3B}{largesymbols}{"3B}
% \DeclareMathDelimiter{\bracevert} % the vertical bar that extends braces
%      {\mathord}{largesymbols}{"3E}{largesymbols}{"3E}
\DeclareMathSymbol{\mathparagraph}{\mathord}{letters}{"91}
\DeclareMathSymbol{\mathsection}{\mathord}{letters}{"90}
```

4.4.2 New symbols and accents

Ordinary symbols:

```
\DeclareMathSymbol{\openclubsuit}{\mathord}{symbols}{"80}
\DeclareMathSymbol{\shadedclubsuit}{\mathord}{symbols}{"81}
\DeclareMathSymbol{\openspadesuit}{\mathord}{symbols}{"82}
\DeclareMathSymbol{\shadedspadesuit}{\mathord}{symbols}{"83}
\DeclareMathSymbol{\hslash}{\mathord}{symbols}{175}
\DeclareMathSymbol{\digamma}{\mathord}{symbols}{177}
\DeclareMathSymbol{\mathyen}{\mathord}{symbols}{176}
\DeclareRobustCommand{\yen}{\ifmmode\mathyen\else\textyen\fi}
```

Binary operators:

```
\DeclareMathSymbol{\comp}{\mathbin}{symbols}{66}
\DeclareMathSymbol{\setdif}{\mathbin}{symbols}{88}
\DeclareMathSymbol{\cupprod}{\mathbin}{symbols}{89}
```

```
\DeclareMathSymbol{\capprod}{\mathbin}{symbols}{90}
```

Large operators:

```
\DeclareMathSymbol{\bigcupprod}{\mathop}{largesymbols}{"8E}
\DeclareMathSymbol{\bigcapprod}{\mathop}{largesymbols}{"90}
```

MathTimeProfessional has triple and quadruple dot accents and raised dot accents. The definitions of `\dddot` and `\ddddot` are deferred until `\begin{document}`; otherwise they would break amsmath, which tries to define them using `\newcommand`.

```
% \DeclareMathAccent{\dddot}{\mathord}{symbols}{171}
% \DeclareMathAccent{\ddddot}{\mathord}{symbols}{172}
\DeclareMathAccent{\dotup}{\mathord}{symbols}{"54}
\DeclareMathAccent{\ddotup}{\mathord}{symbols}{"55}
\DeclareMathAccent{\dddotup}{\mathord}{symbols}{173}
\DeclareMathAccent{\ddddotup}{\mathord}{symbols}{174}

\let\oacc\mathring
\DeclareMathAccent{\what}  {\mathord}{symbols}{"79}
\DeclareMathAccent{\wtilde}{\mathord}{symbols}{"7A}
\DeclareMathAccent{\wcheck}{\mathord}{symbols}{"7B}
\DeclareMathAccent{\wbar}  {\mathord}{symbols}{"78}

\DeclareMathAccent{\wwhat}  {\mathord}{largesymbols}{"80}
\DeclareMathAccent{\wwtilde}{\mathord}{largesymbols}{"81}
\DeclareMathAccent{\wwcheck}{\mathord}{largesymbols}{"7D}
\DeclareMathAccent{\wwbar}  {\mathord}{symbols}     {"53}
```

A number of symbols that used to be built from pieces are now available as ready-made characters:

```
\DeclareMathSymbol{\hbar}  {\mathord}{symbols}{"84}
\let\notin\@undefined
\DeclareMathSymbol{\notin} {\mathrel}{symbols}{"85}
\let\angle\@undefined
\DeclareMathSymbol{\angle} {\mathord}{symbols}{"86}
\let\models\@undefined
\DeclareMathSymbol{\models}{\mathrel}{symbols}{"88}
\let\bowtie\@undefined
\DeclareMathSymbol{\bowtie}{\mathrel}{symbols}{"89}
\let\cong\@undefined
\DeclareMathSymbol{\cong}  {\mathrel}{symbols}{"8A}
\let\Longleftrightarrow\@undefined
\DeclareMathSymbol{\Longleftrightarrow} {\mathrel}{symbols}{"94}
\let\rightleftharpoons\@undefined
\DeclareMathSymbol{\rightleftharpoons}  {\mathrel}{symbols}{"95}
\DeclareMathSymbol{\notless}          {\mathrel}{symbols}{"96}
\DeclareMathSymbol{\notleq}           {\mathrel}{symbols}{"97}
\DeclareMathSymbol{\notprec}          {\mathrel}{symbols}{"98}
\DeclareMathSymbol{\notpreceq}        {\mathrel}{symbols}{"99}
\DeclareMathSymbol{\notsubset}        {\mathrel}{symbols}{"9A}
\DeclareMathSymbol{\notsubseteq}      {\mathrel}{symbols}{"9B}
\DeclareMathSymbol{\notsqsubseteq}    {\mathrel}{symbols}{"9C}
\DeclareMathSymbol{\notgr}            {\mathrel}{symbols}{"9D}
```

```
\DeclareMathSymbol{\notgeq}           {\mathrel}{symbols}{"9E}
\DeclareMathSymbol{\notsucc}          {\mathrel}{symbols}{"9F}
\DeclareMathSymbol{\notsucceq}        {\mathrel}{symbols}{160}
\DeclareMathSymbol{\notsupset}        {\mathrel}{symbols}{161}
\DeclareMathSymbol{\notsupseteq}      {\mathrel}{symbols}{162}
\DeclareMathSymbol{\notsqsupseteq}    {\mathrel}{symbols}{163}
\let\neq\@undefined
\DeclareMathSymbol{\neq}              {\mathrel}{symbols}{164}
\let\ne=\neq
\DeclareMathSymbol{\notequiv}         {\mathrel}{symbols}{165}
\DeclareMathSymbol{\notsim}           {\mathrel}{symbols}{166}
\DeclareMathSymbol{\notsimeq}         {\mathrel}{symbols}{167}
\DeclareMathSymbol{\notapprox}        {\mathrel}{symbols}{168}
\DeclareMathSymbol{\notcong}          {\mathrel}{symbols}{169}
\DeclareMathSymbol{\notasymp}         {\mathrel}{symbols}{170}
```

Part of the above symbols get alternative names, which follow the naming scheme of the AMS:

```
\let\nless=\notless
\let\nleq=\notleq
\let\nprec=\notprec
\let\npreceq=\notpreceq
\let\nsubset=\notsubset
\let\nsubseteq=\notsubseteq
\let\nsqsubseteq=\notsqsubseteq
\let\ngtr=\notgr
\let\ngeq=\notgeq
\let\nsucc=\notsucc
\let\nsucceq=\notsucceq
\let\nsupset=\notsupset
\let\nsupseteq=\notsupseteq
\let\nsqsupseteq=\notsqsupseteq
\let\ncong=\notcong
```

Unfortunately, the amsmath package provides its own definitions of the following symbols. We must not overwrite them, if amslatex was loaded before mtpro. (amsmath was designed with only the standard CM fonts in mind; this constitutes sometimes a real problem!)

```
\@ifpackageloaded{amsmath}{}{%
  \let\doteq\@undefined
  \let\hookleftarrow\@undefined
  \let\hookrightarrow\@undefined
  \let\longleftarrow\@undefined
  \let\longrightarrow\@undefined
  \let\Longleftarrow\@undefined
  \let\Longrightarrow\@undefined
  \let\mapsto\@undefined
  \let\longmapsto\@undefined
  \let\longleftrightarrow\@undefined
  \DeclareMathSymbol{\doteq} {\mathrel}{symbols}{"87}
  \DeclareMathSymbol{\hookleftarrow} {\mathrel}{symbols}{"8B}
  \DeclareMathSymbol{\hookrightarrow}{\mathrel}{symbols}{"8C}
```

```
  \DeclareMathSymbol{\longleftarrow} {\mathrel}{symbols}{"8D}
  \DeclareMathSymbol{\longrightarrow}{\mathrel}{symbols}{"8E}
  \DeclareMathSymbol{\Longleftarrow} {\mathrel}{symbols}{"8F}
  \DeclareMathSymbol{\Longrightarrow}{\mathrel}{symbols}{"90}
  \DeclareMathSymbol{\mapsto}    {\mathrel}{symbols}{"91}
  \DeclareMathSymbol{\longmapsto}{\mathrel}{symbols}{"92}
  \DeclareMathSymbol{\longleftrightarrow} {\mathrel}{symbols}{"93}
}
```

One might think of repeating the AMS-style definitions with our ready-made symbols patched in, if amsmath is detected. However, doing so would create an unwanted dependency: We would have to mirror all future changes the AMS applies possibly to their code!

Additional integral signs:

```
\DeclareMathSymbol{\iintop}{\mathop}{largesymbols}{"92}
\DeclareMathSymbol{\iiintop}{\mathop}{largesymbols}{"94}
\DeclareMathSymbol{\oiintop}{\mathop}{largesymbols}{"96}
\DeclareMathSymbol{\oiiintop}{\mathop}{largesymbols}{"98}
\DeclareMathSymbol{\cwointop}{\mathop}{largesymbols}{"9A}
\DeclareMathSymbol{\awointop}{\mathop}{largesymbols}{"9C}
\DeclareMathSymbol{\cwintop}{\mathop}{largesymbols}{"9E}
```

The definitions of the actual integral commands such as `\int` are deferred until `\begin{document}`, see the next section.

4.4.3 Compatibility with amsmath

In case amsmath is loaded after mtpro, we will have to restore our definition of the macro `\Relbar`; we also must make sure that things like `\mathrm{\hat{A}}` don't come out as garbage. `\dddot` and `\ddddot`, too, must not be defined earlier.

```
\AtBeginDocument{%
  \@ifpackageloaded{amsmath}{%
    \let\Relbar\@undefined
    \DeclareMathSymbol{\Relbar}{\mathrel}{symbols}{"48}
    \def\accentclass@{0}
  }{}%
  \let\dddot\@undefined\let\ddddot\@undefined
  \DeclareMathAccent{\dddot}{\mathord}{symbols}{171}
  \DeclareMathAccent{\ddddot}{\mathord}{symbols}{172}
```

As far as the extra integrals commands are concerned, we must overwrite the definitions that may come from the amsmath package. Our definitions are compatible with that package, but they work equally well without it: We just have to make sure that 'empty' definitions of the macros `\DOTSI` and `\ilimits@` are provided if amsmath is *not* used:

```
  \ifx\DOTSI\@undefined\let\DOTSI\relax\fi
  \ifx\ilimits@\@undefined\let\ilimits@\nolimits\fi
  \def\iint{\DOTSI\iintop\ilimits@}
  \def\iiint{\DOTSI\iiintop\ilimits@}
  \def\oiint{\DOTSI\oiintop\ilimits@}
  \def\oiiint{\DOTSI\oiiintop\ilimits@}
```

```
  \def\cwoint{\DOTSI\cwointop\ilimits@}
  \def\awoint{\DOTSI\awointop\ilimits@}
  \def\cwint{\DOTSI\cwintop\ilimits@}
}
```

4.5 Large delimiters, accents and roots

The below code has been adopted from M. Spivak's plain TEX package `mtp.tex` as of 2001-01-11, with fixes regarding the use of `\displaystyle`.

Large delimiters:

```
\newbox\prePbox@
\newbox\Pbox@
\newif\ifPEX@
\def\PEX@#1{\setbox\Pbox@\vbox{$$\left.\vcenter{\copy\prePbox@}\right)$$}%
\setbox\Pbox@\vbox{\unvbox\Pbox@\unskip\unpenalty
\setbox\Pbox@\lastbox
\setbox\Pbox@\hbox{\unhbox\Pbox@\setbox\Pbox@\lastbox
\setbox\Pbox@\hbox{\unhbox\Pbox@\setbox\Pbox@\lastbox
\setbox0\hbox{#1}%
\ifdim\dp\Pbox@>\dp0\global\PEX@true\else
\global\PEX@false\fi}}}}

\def\EXtest@#1{\setbox\prePbox@\hbox{$\displaystyle{#1}$}%
\PEX@{\MTEXA@\char32}%
\ifPEX@
{\textfont3=\MTEXE@\PEX@{\MTEXE@\char12}}%
\ifPEX@
{\textfont3=\MTEXF@\PEX@{\MTEXF@\char12}}%
\ifPEX@
\def\EXtest@@{\textfont3=\MTEXG@}%
\else
\def\EXtest@@{\textfont3=\MTEXF@}%
\fi
\else
\def\EXtest@@{\textfont3=\MTEXE@}%
\fi
\else
\def\EXtest@@{\textfont3=\MTEXA@}%
\fi}

\newbox\LRbox@
\def\LEFTRIGHT@#1#2#3{\setbox\LRbox@\hbox{$\displaystyle{#3}$}%
 \EXtest@{#3}%
 \vcenter{\hbox{\EXtest@@$\displaystyle\left#1\box\LRbox@\right#2$}}}%

\def\PARENS#1{\LEFTRIGHT@(){#1}}%

\newif\ifspecdelim@
\def\specdelim@#1{\ifx#1(\specdelim@true
\else\ifx#1)\specdelim@true
\else\ifx#1<\specdelim@true
\else\ifx#1\langle\specdelim@true
\else\ifx#1>\specdelim@true
```

```
\else\ifx#1\rangle\specdelim@true
\else\ifx#1/\specdelim@true
\else\ifx#1\backslash\specdelim@true
\else\specdelim@false\fi\fi\fi\fi\fi\fi\fi\fi}

\def\LEFTRIGHT#1#2#3{\specdelim@#1%
\ifspecdelim@\LEFTRIGHT@#1.{#3}\else\left#1{#3}\right.\fi
\kern-2\nulldelimiterspace\mskip-\thinmuskip
\specdelim@#2%
\ifspecdelim@\LEFTRIGHT@.#2{\vphantom{#3}}\else
\left.\vphantom{#3}\right#2\fi}%
```

Wide ‘hat’ accents:

```
\newbox\HATbox@
\def\widehat#1{\setbox\HATbox@\hbox{$\displaystyle{#1}$}%
\setbox0\hbox{\MTEXF@;}%
\ifdim\wd\HATbox@>\wd0
\def\HAT@{\textfont3=\MTEXG@}%
\else
\setbox0\hbox{\MTEXE@9}%
\ifdim\wd\HATbox@>\wd0
\def\HAT@{\textfont3=\MTEXF@}%
\else
\setbox0\hbox{\MTEXA@ d}%
\ifdim\wd\HATbox@>\wd0
\def\HAT@{\textfont3=\MTEXE@}%
\else
\def\HAT@{\textfont3=\MTEXA@}%
\fi
\fi
\fi
\hbox{\HAT@$\mathaccent"0362 {#1}$}}
```

Wide tilde accents:

```
\newbox\TDbox@
\def\widetilde#1{\setbox\TDbox@\hbox{$\displaystyle{#1}$}%
\setbox0\hbox{\MTEXF@ K}%
\ifdim\wd\TDbox@>\wd0
\def\TD@{\textfont3=\MTEXG@}%
\else
\setbox0\hbox{\MTEXE@ I}%
\ifdim\wd\TDbox@>\wd0
\def\TD@{\textfont3=\MTEXF@}%
\else
\setbox0\hbox{\MTEXA@ d}%
\ifdim\wd\TDbox@>\wd0
\def\TD@{\textfont3=\MTEXE@}%
\else
\def\TD@{\textfont3=\MTEXA@}%
\fi
\fi
\fi
\hbox{\TD@$\mathaccent"0365 {#1}$}}
```

Wide ‘check’ accents:

```
\newbox\CHbox@
\def\widecheck#1{\setbox\CHbox@\hbox{$\displaystyle{#1}$}%
\setbox0\hbox{\MTEXF@[}%
\ifdim\wd\CHbox@>\wd0
\def\CHECK@{\textfont3=\MTEXG@}%
\else
\setbox0\hbox{\MTEXE@ Y}%
\ifdim\wd\CHbox@>\wd0
\def\CHECK@{\textfont3=\MTEXF@}%
\else
\setbox0\hbox{\MTEXA@ z}%
\ifdim\wd\CHbox@>\wd0
\def\CHECK@{\textfont3=\MTEXE@}%
\else
\def\CHECK@{\textfont3=\MTEXA@}%
\fi
\fi
\fi
\hbox{\CHECK@$\mathaccent"037A {#1}$}}%
```

Large roots: The command `\SQRT` from the plain TEX package `mtp.tex` is named `\SQR@@T` here.

```
\newbox\preSbox@
\newbox\Sbox@
\newif\ifSQEX@
\def\SQEX@#1{\setbox\Sbox@\vbox{$$\radical"270370{\copy\preSbox@}$$}%
\setbox\Sbox@\vbox{\unvbox\Sbox@\unskip\unpenalty
\setbox\Sbox@\lastbox\setbox\Sbox@\hbox{\unhbox\Sbox@\setbox\Sbox@\lastbox
\setbox\Sbox@\hbox{\unhbox\Sbox@\setbox\Sbox@\lastbox\setbox\Sbox@\lastbox
\setbox0\hbox{#1}%
\ifdim\dp\Sbox@>\dp0\global\SQEX@true\else
\global\SQEX@false\fi}}}}
\newcount\SQcount@
\def\SQtest@#1{\setbox\preSbox@\hbox{$\displaystyle{#1}$}%
\SQEX@{\MTEXA@ s}%
\ifSQEX@
{\textfont3=\MTEXE@\SQEX@{\MTEXE@ u}}%
\ifSQEX@
{\textfont3=\MTEXF@\SQEX@{\MTEXF@ u}}%
\ifSQEX@
\def\SQtest@@{\textfont3=\MTEXG@}\global\SQcount@3
\else
\def\SQtest@@{\textfont3=\MTEXF@}\global\SQcount@2
\fi
\else
\def\SQtest@@{\textfont3=\MTEXE@}\global\SQcount@1
\fi
\else
\def\SQtest@@{\textfont3=\MTEXA@}\global\SQcount@0
\fi}
\newbox\SQRTbox@
```

```
\def\SQR@@T#1{\setbox\SQRTbox@\hbox{$\displaystyle{#1}$}%
\SQtest@{#1}%
\hbox{\SQtest@@$\displaystyle\radical"270370{\box\SQRTbox@}$}}
```

The names of the counters `\leftroot@` and `\uproot@` and the related commands `\leftroot` and `\uproot` had to be changed to uppercase, so as not to clash with the amsmath package. The syntax differs from amsmath, anyway.

```
\newcount\UPROOT@
\newcount\LEFTROOT@
\def\LEFTROOT#1{\relax
  \ifmmode\LEFTROOT@#1\relax
  \else\PackageError{mtpro}
         {\protect\LEFTROOT\space allowed only in math mode}
         {Type <return> to proceed; the command will be ignored.}
  \fi}
\def\UPROOT#1{\relax
  \ifmmode\UPROOT@#1\relax
  \else\PackageError{mtpro}
         {\protect\UPROOT\space allowed only in math mode}
         {Type <return> to proceed; the command will be ignored.}
  \fi}
\def\ROOT#1\OF#2{\setbox\rootbox\hbox{$\m@th\scriptscriptstyle{#1}$}%
\mathpalette\R@@T{#2}}
\def\R@@T#1#2{\setbox\z@\hbox{$\UPROOT@\z@\LEFTROOT@\z@\m@th#1\SQR@@T{#2}$}%
\dimen@\ht\z@\advance\dimen@-\dp\z@
\dimen@ii\dimen@
\setbox\tw@\hbox{$\m@th#1\mskip\UPROOT@ mu$}\advance\dimen@ii by1.667\wd\tw@
\setbox\tw@\hbox{$\m@th#1\mskip10mu$}%
\ifcase\SQcount@\advance\dimen@3\wd\tw@\or\advance\dimen@1.5\wd\tw@\or
\advance\dimen@\wd\tw@\fi
\mkern1mu\kern.13\dimen@\mkern-\LEFTROOT@ mu
\raise.5\dimen@ii\copy\rootbox % was .44
\mkern-1mu\kern-.13\dimen@\mkern\LEFTROOT@ mu\box\z@\kern-\wd\rootbox
\LEFTROOT\z@\UPROOT\z@}
```

Finally the roots are given a more LaTeX-like syntax, so that one can say, e.g., `\SQRT[3]{...}` instead of `\ROOT 3 \OF ...` .

```
\DeclareRobustCommand\SQRT{\@ifnextchar[\SQRT@\SQR@@T}
\def\SQRT@[#1]{\ROOT #1\OF}
```

4.6 Extra-large operators

The code in this section has been adopted from M. Spivak's plain TeX package `mtp.tex` 4.0 as of Sept. 2004.

The macros assume that `\MTXL@` and `\MTXXXL@` refer to the fonts `mtxl` and `mtxxxl`. The macro `\eat@` has been replaced with `\@gobble`, which is already provided by the LaTeX kernel.

`\FNSS@` is `\futurelet\next` skipping spaces before the next token.

```
\def\FNSS@#1{\let\FNSS@@#1\FN@\FNSS@@@}
\def\FNSS@@@{\ifx\next\space@\def\FNSS@@@@. {\FN@\FNSS@@@}\else
 \def\FNSS@@@@.{\FNSS@@}\fi\FNSS@@@@.}
```

We define struts for subscripts and superscripts to give the extra space that would normally be provided for limits of large operators.

```
\def\fdxiii@sub{\vrule height\fontdimen13 \the\textfont3 width\z@ depth\z@}
\def\fdxiii@sup{\vrule depth\fontdimen13 \the\textfont3 width\z@ height\z@}
```

`\xl#1#2` etc., will define `\next@`, depending on the next symbol. `\largeopx@` and `\largeopxNL@` will be used for `\xl`, `\XL` and `\XXL`, with all operators other than `\int`, etc., and `\largeopxxx@` and `\largeopxxxNL@` will be used for `\XXXL`.

We make the definitions in terms of a common one that uses the font as the argument.

```
\def\LARGEOPx@#1#2#3{%
```

`#1`=0 or 1 for 'limits' or no 'limits'; `#2` is font, `#3` is char position

```
 \ifnum#1=\@ne
  \def\next@{\mathop{\hbox{$\vcenter{\hbox{#2\char#3}}$}}\nolimits
    _{\SUB@}^{\SUP@}\@gobble}%
 \else
  \def\next@{\mathop{\hbox{$\vcenter{\hbox{#2\char#3}}$}}%
    _{\SUB@}^{\SUP@}\@gobble}%
 \fi}
\def\largeopx@#1#2{\LARGEOPx@#1\MTXL@{#2}}
\def\largeopxxx@#1#2{\LARGEOPx@#1\MTXXXL@{#2}}
```

Similarly, for `\LARGEINTx@`. When there are 'limits', the construction is especially complicated. `\maxXLscripts@` will store the maximum of the widths of the subscripts and superscripts. There is the additional complication that the amount to adjust the superscript differs for `\XL` and `\XXL`, and the adjustment is made in terms of an extra `\fontdimen` in the `mtxxl` font, which measures the horizontal distance between the lowest and highest points of the integral sign (for the `\XXL` versions these are exactly twice the `\XL` versions).

```
\newdimen\maxXLscripts@
\newcount\X@count
```

`\X@count`: 0 for `\XL`, 1 for `\XXL`, 2 for `\XXXL`, 3 for `\xl`.

```
\def\LARGEINTx@#1#2#3{%
 \ifnum#1=\@ne
  \def\next@{\setbox\z@\hbox{#2\char#3\/}\dimen@\wd\z@
  \setbox\z@\hbox{#2\char#3}\advance\dimen@-\wd\z@
  \mathop{\hbox{$\vcenter{\hbox{#2\char#3}}$}}\nolimits
   _{\SUB@}^{\kern\dimen@\SUP@}\@gobble}%
 \else
  \def\next@{\setbox\z@\hbox{\ifcase\X@count\kern\tw@\fontdimen8\MTXL@\or
   \kern4\fontdimen8\MTXL@\or
   \kern\tw@\fontdimen8\MTXXXL@\or
   \kern1.7\fontdimen8\MTXL@\fi}%
\setbox\@ne\hbox{#2\char#3}%
  \setbox\tw@\hbox{$\scriptstyle{\SUB@}$}%
  \setbox\thr@@\hbox{$\kern\wd\z@\scriptstyle{\SUP@}$}%
```

let `\maxXLscripts@` be max of subscript and superscript boxes

```
  \maxXLscripts@\wd\thr@@\ifdim\maxXLscripts@<\wd\tw@\maxXLscripts@\wd\tw@\fi
```

let \dimen@ii be amount of subscript to left of integral

```
  \dimen@ii.5\wd\tw@ \advance\dimen@ii-.5\wd\@ne
```

Let \dimen@ be amount of visible superscript to left of int, namely [visible length] - [amount to right of left boundary of \int sign], i.e., [wd3 - wd0] - 1/2(wd3 + wd1)

```
  \dimen@.5\wd\thr@@ \advance\dimen@-\wd\z@ \advance\dimen@-.5\wd\@ne
  \ifdim\dimen@>\z@ % if visible part of superscript extends to left of \int
    \ifdim\dimen@>\dimen@ii%
```

if visible part of superscript to left of subscript, kern by - [1/2(\maxXLscripts@ - wd1) - \dimen@]

```
     \kern\dimen@\kern.5\wd\@ne\kern-.5\maxXLscripts@
    \else
```

only trim to subscript, kern - [1/2(\maxXLscripts@ - wd1) - \dimen@ii]

```
     \kern\dimen@ii\kern.5\wd\@ne\kern-.5\maxXLscripts@
    \fi
  \else
```

visible part of superscript entirely to right of \int, so trim to subscript

```
    \ifdim\dimen@ii > \z@
     \kern\dimen@ii\kern.5\wd\@ne\kern-.5\maxXLscripts@
    \else
     \kern.5\wd\@ne\kern-.5\maxXLscripts@
    \fi
  \fi
  \setbox\@ne\hbox{#2\char#3\/}\dimen@ii\wd\@ne
  \setbox\@ne\hbox{#2\char#3}\advance\dimen@ii-\wd\@ne
  \mathop{\hbox{$\vcenter{\hbox{#2\char#3}}$}}_{\SUB@}^{\kern\wd\z@\SUP@}%
    \kern\dimen@ii\@gobble}%
\fi}
\def\largeintx@#1#2{\LARGEINTx@#1\MTXL@{#2}}
\def\largeintxxx@#1#2{\LARGEINTx@#1\MTXXXL@{#2}}

\newcount\XLtype@

\def\xl{\XLtype@\z@\x@l}
\def\xlnl{\XLtype@\@ne\x@l}
\def\x@l#1#2{\def\SUB@{#1}\def\SUP@{#2}\futurelet\next\xl@}
\def\xl@{\X@count\thr@@
 \ifx\next\bigodot\largeopx@\XLtype@{96}\else
 \ifx\next\bigoplus\largeopx@\XLtype@{97}\else
 \ifx\next\bigotimes\largeopx@\XLtype@{98}\else
 \ifx\next\bigsqcup\largeopx@\XLtype@{99}\else
 \ifx\next\bigcup\largeopx@\XLtype@{100}\else
 \ifx\next\bigcap\largeopx@\XLtype@{101}\else
 \ifx\next\biguplus\largeopx@\XLtype@{102}\else
 \ifx\next\bigwedge\largeopx@\XLtype@{103}\else
 \ifx\next\bigvee\largeopx@\XLtype@{104}\else
 \ifx\next\sum\largeopx@\XLtype@{105}\else
 \ifx\next\prod\largeopx@\XLtype@{106}\else
 \ifx\next\coprod\largeopx@\XLtype@{107}\else
 \ifx\next\int\largeintx@\XLtype@{108}\else
```

```
 \ifx\next\oint\largeintx@\XLtype@{109}\else
 \ifx\next\bigcupprod\largeopx@\XLtype@{110}\else
 \ifx\next\bigcapprod\largeopx@\XLtype@{111}\else
 \ifx\next\cwoint\largeintx@\XLtype@{112}\else
 \ifx\next\awoint\largeintx@\XLtype@{113}\else
 \ifx\next\cwint\largeintx@\XLtype@{114}\else
 \ifx\next\iint\largeintx@\XLtype@{115}\else
 \ifx\next\iiint\largeintx@\XLtype@{116}\else
 \ifx\next\oiint\largeintx@\XLtype@{117}\else
 \ifx\next\oiiint\largeintx@\XLtype@{118}\else
 \PackageError{mtpro}%
   {Invalid use of \protect\xl}%
   {\protect\xl\space can be applied to ‘large operators’ only.}%
 \fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\next@}
\def\XL{\XLtype@\z@\X@L}
\def\XLNL{\XLtype@\@ne\X@L}
\def\X@L#1#2{\def\SUB@{#1}\def\SUP@{#2}\futurelet\next\XL@}
\def\XL@{\X@count\z@
 \ifx\next\bigodot\largeopx@\XLtype@0\else
 \ifx\next\bigoplus\largeopx@\XLtype@1\else
 \ifx\next\bigotimes\largeopx@\XLtype@2\else
 \ifx\next\bigsqcup\largeopx@\XLtype@3\else
 \ifx\next\bigcup\largeopx@\XLtype@4\else
 \ifx\next\bigcap\largeopx@\XLtype@5\else
 \ifx\next\biguplus\largeopx@\XLtype@6\else
 \ifx\next\bigwedge\largeopx@\XLtype@7\else
 \ifx\next\bigvee\largeopx@\XLtype@8\else
 \ifx\next\sum\largeopx@\XLtype@9\else
 \ifx\next\prod\largeopx@\XLtype@{10}\else
 \ifx\next\coprod\largeopx@\XLtype@{11}\else
 \ifx\next\int\largeintx@\XLtype@{12}\else
 \ifx\next\oint\largeintx@\XLtype@{13}\else
 \ifx\next\bigcupprod\largeopx@\XLtype@{14}\else
 \ifx\next\bigcapprod\largeopx@\XLtype@{15}\else
 \ifx\next\cwoint\largeintx@\XLtype@{16}\else
 \ifx\next\awoint\largeintx@\XLtype@{17}\else
 \ifx\next\cwint\largeintx@\XLtype@{18}\else
 \ifx\next\iint\largeintx@\XLtype@{19}\else
 \ifx\next\iiint\largeintx@\XLtype@{20}\else
 \ifx\next\oiint\largeintx@\XLtype@{21}\else
 \ifx\next\oiiint\largeintx@\XLtype@{22}\else
\PackageError{mtpro}%
  {Invalid use of \protect\XL}%
  {\protect\XL\space can be applied to ‘large operators’ only.}%
 \fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\next@}
\def\XXL{\XLtype@\z@\XX@L}
\def\XXLNL{\XLtype@\@ne\XX@L}
\def\XX@L#1#2{\def\SUB@{#1}\def\SUP@{#2}\futurelet\next\XXL@}
\def\XXL@{\X@count\@ne
 \ifx\next\bigodot\largeopx@\XLtype@{48}\else
 \ifx\next\bigoplus\largeopx@\XLtype@{49}\else
```

```
\ifx\next\bigotimes\largeopx@\XLtype@{50}\else
\ifx\next\bigsqcup\largeopx@\XLtype@{51}\else
\ifx\next\bigcup\largeopx@\XLtype@{52}\else
\ifx\next\bigcap\largeopx@\XLtype@{53}\else
\ifx\next\biguplus\largeopx@\XLtype@{54}\else
\ifx\next\bigwedge\largeopx@\XLtype@{55}\else
\ifx\next\bigvee\largeopx@\XLtype@{56}\else
\ifx\next\sum\largeopx@\XLtype@{57}\else
\ifx\next\prod\largeopx@\XLtype@{58}\else
\ifx\next\coprod\largeopx@\XLtype@{59}\else
\ifx\next\int\largeintx@\XLtype@{60}\else
\ifx\next\oint\largeintx@\XLtype@{61}\else
\ifx\next\bigcupprod\largeopx@\XLtype@{62 \char64}\else
\ifx\next\bigcapprod\largeopx@\XLtype@{63 \char65}\else
\ifx\next\cwoint\largeintx@\XLtype@{66}\else
\ifx\next\awoint\largeintx@\XLtype@{67}\else
\ifx\next\cwint\largeintx@\XLtype@{68}\else
\ifx\next\iint\largeintx@\XLtype@{69}\else
\ifx\next\iiint\largeintx@\XLtype@{70}\else
\ifx\next\oiint\largeintx@\XLtype@{71}\else
\ifx\next\oiiint\largeintx@\XLtype@{72}\else
\PackageError{mtpro}%
  {Invalid use of \protect\XXL}%
  {\protect\XXL\space can be applied to ‘large operators’ only.}%
\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\next@}
\def\XXXL{\XLtype@\z@\XXX@L}
\def\XXXLNL{\XLtype@\@ne\XXX@L}
\def\XXX@L#1#2{\def\SUB@{#1}\def\SUP@{#2}\futurelet\next\XXXL@}
\def\XXXL@{\X@count\tw@
\ifx\next\bigodot\largeopxxx@\XLtype@0\else
\ifx\next\bigoplus\largeopxxx@\XLtype@1\else
\ifx\next\bigotimes\largeopxxx@\XLtype@2\else
\ifx\next\bigsqcup\largeopxxx@\XLtype@3\else
\ifx\next\bigcup\largeopxxx@\XLtype@4\else
\ifx\next\bigcap\largeopxxx@\XLtype@5\else
\ifx\next\biguplus\largeopxxx@\XLtype@6\else
\ifx\next\bigwedge\largeopxxx@\XLtype@7\else
\ifx\next\bigvee\largeopxxx@\XLtype@8\else
\ifx\next\sum\largeopxxx@\XLtype@9\else
\ifx\next\prod\largeopxxx@\XLtype@{10}\else
\ifx\next\coprod\largeopxxx@\XLtype@{11}\else
\ifx\next\int\largeintxxx@\XLtype@{12}\else
\ifx\next\oint\largeintxxx@\XLtype@{13}\else
```

XXXL `\bigcupprod` is too wide for PostScript, so it is split into parts in positions 14 and 16; similarly `\bigcapprod` is in positions 15 and 17.

```
\ifx\next\bigcupprod\largeopxxx@\XLtype@{14 \char16}\else
\ifx\next\bigcapprod\largeopxxx@\XLtype@{15 \char17}\else
\ifx\next\cwoint\largeintxxx@\XLtype@{18}\else
\ifx\next\awoint\largeintxxx@\XLtype@{19}\else
\ifx\next\cwint\largeintxxx@\XLtype@{20}\else
\ifx\next\iint\largeintxxx@\XLtype@{21}\else
```

```
\ifx\next\iiint\largeintxxx@\XLtype@{22}\else
\ifx\next\oiint\largeintxxx@\XLtype@{23}\else
\ifx\next\oiiint\largeintxxx@\XLtype@{24}\else
\def\next@{\PackageError{mtpro}%
  {Invalid use of \protect\XXXL}%
  {\protect\XXXL\space can be applied to 'large operators' only.}}%
\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\next@}
```

4.7 Math font sizes

MathTimeProfessional, unlike most other Type 1 font families, has several design sizes. As a result, we can make the subscripts and superscripts (almost) as small as with standard TEX.

```
\def\defaultscriptratio{.7}
\def\defaultscriptscriptratio{.55}
\DeclareMathSizes{5}{5}{5}{5}
\DeclareMathSizes{6}{6}{5}{5}
\DeclareMathSizes{7}{7}{5}{5}
\DeclareMathSizes{8}{8}{6}{5}
\DeclareMathSizes{9}{9}{7}{5.5}
\DeclareMathSizes{\@xpt}{\@xpt}{7}{5.5}
\DeclareMathSizes{\@xipt}{\@xipt}{8}{6}
\DeclareMathSizes{\@xiipt}{\@xiipt}{8}{6}
\DeclareMathSizes{\@xivpt}{\@xivpt}{\@xpt}{7}
\DeclareMathSizes{\@xviipt}{\@xviipt}{\@xiipt}{\@xpt}
\DeclareMathSizes{\@xxpt}{\@xxpt}{\@xivpt}{\@xiipt}
\DeclareMathSizes{\@xxvpt}{\@xxvpt}{\@xxpt}{\@xviipt}
```

4.8 Encoding-specific text commands

Some encoding-specific commands default to the OML or OMS encoding. As these encodings are not used with *MathTimeProfessional*, we need to change the defaults.

These ones used to default to OML:

```
\DeclareTextSymbolDefault{\textless}{MPY1}
\DeclareTextSymbolDefault{\textgreater}{MPY1}
\DeclareTextAccentDefault{\t}{MPY2}
```

After re-declaring the default encoding we must not forget to declare the very symbol, otherwise calling the command will generate a loop. Or to quote David:

> Hmm, otherwise you waste an hour or two staring at `\tracingall` output trying to work out what the heck is happening.

```
\DeclareTextSymbol{\textless}{MPY1}{'\<}
\DeclareTextSymbol{\textgreater}{MPY1}{'\>}
\DeclareTextAccent{\t}{MPY2}{65}
```

These ones used to default to OMS:

```
\DeclareTextSymbolDefault{\textasteriskcentered}{MPY2}
\DeclareTextSymbolDefault{\textbackslash}{MPY2}
```

```
\DeclareTextSymbolDefault{\textbar}{MPY2}
\DeclareTextSymbolDefault{\textbraceleft}{MPY2}
\DeclareTextSymbolDefault{\textbraceright}{MPY2}
\DeclareTextSymbolDefault{\textbullet}{MPY2}
\DeclareTextSymbolDefault{\textperiodcentered}{MPY2}
\DeclareTextAccentDefault{\textcircled}{MPY2}
\DeclareTextSymbol{\textasteriskcentered}{MPY2}{3}
\DeclareTextSymbol{\textbackslash}{MPY2}{110}
\DeclareTextSymbol{\textbar}{MPY2}{106}
\DeclareTextSymbol{\textbraceleft}{MPY2}{102}
\DeclareTextSymbol{\textbraceright}{MPY2}{103}
\DeclareTextSymbol{\textbullet}{MPY2}{15}
\DeclareTextSymbol{\textperiodcentered}{MPY2}{1}
\DeclareTextCommand{\textcircled}{MPY2}[1]{{%
   \ooalign{%
      \hfil \raise .07ex\hbox {\upshape#1}\hfil \crcr
      \char13}}}
```

The remaining symbols need *not* be redefined, if the textcomp package is also loaded.

```
\@ifpackageloaded{textcomp}{}{%
  \DeclareTextSymbolDefault{\textdagger}{MPY1}
  \DeclareTextSymbolDefault{\textdaggerdbl}{MPY1}
  \DeclareTextSymbolDefault{\textsection}{MPY1}
  \DeclareTextSymbolDefault{\textparagraph}{MPY1}
  \DeclareTextSymbolDefault{\textyen}{MPY2}
  \DeclareTextSymbol{\textdagger}{MPY1}{"8E}
  \DeclareTextSymbol{\textdaggerdbl}{MPY1}{"8F}
  \DeclareTextSymbol{\textsection}{MPY1}{"90}
  \DeclareTextSymbol{\textparagraph}{MPY1}{"91}
```

A default `\textyen` symbol can be made available, now that it is provided in the MPY2 encoding:

```
  \DeclareTextSymbol{\textyen}{MPY2}{176}}
```

4.9 Encoding-specific math commands

`\mathsterling` and `\mathunderscore` come from the 'operators' font. The default definitions supplied by LaTeX match OT1, so the commands must be redefined, if the encoding is LY1 or T1.

```
\def\@tempa{LY1}
\ifx\encodingdefault\@tempa
    \DeclareMathSymbol{\mathsterling}{\mathord}{operators}{163}
    \let\mathunderscore\@undefined
    \DeclareMathSymbol{\mathunderscore}{\mathord}{operators}{95}
\else
  \def\@tempa{T1}
  \ifx\encodingdefault\@tempa
    \DeclareMathSymbol\mathsterling{\mathord}{operators}{191}
    \let\mathunderscore\@undefined
    \DeclareMathSymbol\mathunderscore{\mathord}{operators}{95}
  \fi
```

```
\fi
```

4.10 Subscript correction

We provide a definition for _ as active character. This definition in itself is not changing LaTeX's behavior, as by default _ has catcode 8, i.e., subscript character. Only if we change this catcode or if we change the `\mathcode` of _ TeX is going to look at it.

```
\begingroup
 \catcode`\_=13
 \gdef_#1{\sb{\test@sb#1}}
\endgroup
```

The `\test@sb` gets passed the argument of a subscript and tests with `\@ifnextchar` if the first non-space token is a `f`. If not it will look at `\@let@token` (set by `\@ifnextchar`) to see if it is perhaps `j`, `p`, `t` etc. In each case it will add an appropriate kern. The kerning values were adopted from `mtp.tex`.

Notice that this will fail if an old LaTeX is used, as the old definition of `\@ifnextchar` does not use `\@let@token` but `\@tempa`. However, the worst that would happen is that the kern is not inserted, and we request a LaTeX not older than 1997/06/01, anyway.

```
\def\test@sb{%
  \@ifnextchar f%
    {\mkern-\thr@@ mu}%
    {\ifx\@let@token j\mkern-\tw@ mu\else
      \ifx\@let@token p\mkern-\tw@ mu\else
      \ifx\@let@token t\mkern\@ne mu\else
      \ifx\@let@token y\mkern-\@ne mu\else
      \ifx\@let@token A\mkern-\tw@ mu\else
      \ifx\@let@token B\mkern-\@ne mu\else
      \ifx\@let@token D\mkern-\@ne mu\else
      \ifx\@let@token H\mkern-\@ne mu\else
      \ifx\@let@token I\mkern-\@ne mu\else
      \ifx\@let@token K\mkern-\@ne mu\else
      \ifx\@let@token L\mkern-\@ne mu\else
      \ifx\@let@token M\mkern-\@ne mu\else
      \ifx\@let@token P\mkern-\@ne mu\else
      \ifx\@let@token X\mkern-\tw@ mu\else
     \fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi
     \fi}}
```

Finally we set the `\mathcode` of _ to 'active'. However, as long as its `\catcode` is not changed, this `\mathcode` is never looked at; in other words: we can now turn the feature on and off by changing the `\catcode` to 12, which is done in the options code above.

```
\mathcode`\_=\string"8000
```

⟨/mtpro⟩

4.11 Internal changes and fixes

(This section lists only those changes that are not yet documented in section 2.12.)
Version 3.3 as of 2004-05-21:

- ▷ Macros for extra-large operators adapted to the latest version of the fonts.
- ▷ Macros fo extensible delimiters, roots and braces fixed, so as to work properly with `\ver`.

Version 3.0 as of 2004-01-07:

- ▷ Hex numbers that clash with german.sty replaced with decimal numbers.
- ▷ When `\mathbold` is undefined, it is made really `\@undefined` now, rather than `\relax`, so that any attempt to use it will result in an error message.
- ▷ As to the further changes see section 2.12.

Version 2.0.16 as of 2003-12-12:

- ▷ The undocumented options T1, OT1 and LY1 have been abolished. The internal macro `\operator@encoding` is no longer neeed and all occurrences have been replaced with `\encodingdefault`
- ▷ The math symbols `\dagger`, `\ddagger`, `\mathsection` and `\mathparagraph` are now implemented 'as usual'; they need no longer be taken from a text companion font. The related option noTS1 is a no-op now; I have deliberately not removed it, because it might have been used in existing documents.
- ▷ The default encoding for the text symbols `\textdagger`, `\textdaggerdbl`, `\textsection` and `\textparagraph` is simply changed to MPY1, unless the textcomp package has been loaded before. Thus, we make sure that they are taken from *MathTimeProfessional*, if they are not provided in the current text font.
- ▷ The font series for the `\mathbf` alphabet is now `b` rather than `bf`. Rationale: Times and similar font families use to substitute `b` for `bf`, anyway, so we avoid a lot of unnecessary NFSS computing.
- ▷ `\upOmega` is of type `\mathord` now, to make sure that it is always upright. In particular, this avoids problems with the packages gensymb and units.
- ▷ The duplicate definition of `\varkappa` has been removed.
- ▷ The dots-generating macros `\vdots` and `\ddots` are no longer redefined, if the package mathdots is detected. Loading mathdots still afterwards would simply overwrite the macros once again and is not a problem.

▷ The \mathbold alphabet, which used to be present in the old 'Y&Y' version of the package, has been added again. It is defined only, if the package is loaded with the new option boldalphabet. Without the option, all Greek letters are defined as type \mathord so as to ensure against unexpected behavior.

▷ Creating the package file with the additional DocStrip option mtt will include the font definitions for the family mtt into the package file. In this case you need not generate the font definition files additionally.

5 The font definitions for the family mtt

The MPY1 encoding is similar to the OML encoding.

```
⟨*MPY1mtt | mtt⟩
\DeclareFontFamily{MPY1}{mtt}{\skewchar\font45}
\DeclareFontShape{MPY1}{mtt}{m}{it}{<-7> mtmif <7-9> mtmis <9-> mtmit}{}
\DeclareFontShape{MPY1}{mtt}{b}{it}{<-7> mtbmif <7-9> mtbmis <9-> mtbmit}{}
⟨/MPY1mtt | mtt⟩
```

The MPY2 encoding corresponds to the OMS encoding, except for a small number of slots.

```
⟨*MPY2mtt | mtt⟩
\DeclareFontFamily{MPY2}{mtt}{\skewchar\font48}
\DeclareFontShape{MPY2}{mtt}{m}{n}{<-7> mtsyf <7-9> mtsys <9-> mtsyt}{}
\DeclareFontShape{MPY2}{mtt}{b}{n}{<-7> mtbsyf <7-9> mtbsys <9-> mtbsyt}{}
\DeclareFontShape{MPY2}{mtt}{eb}{n}{<-7> mthsyf <7-9> mthsys <9-> mthsyt}{}
⟨/MPY2mtt | mtt⟩
```

The 'extension symbol' font is similar to the Computer Modern cmex font; however, it contains additional symbols. One more encoding just for this reason:

```
⟨*MPY3mtt | mtt⟩
\DeclareFontFamily{MPY3}{mtt}{}
\DeclareFontShape{MPY3}{mtt}{m}{n}{<->mtexa}{}
\DeclareFontShape{MPY3}{mtt}{b}{n}{<->mtbexa}{}
\DeclareFontShape{MPY3}{mtt}{eb}{n}{<->mthexa}{}
⟨/MPY3mtt | mtt⟩
```

There is also a bold upright font, which is used for the \mbf alphabet. It contains letters and digits only, so we assign 'U' as the encoding.

```
⟨*Umtt | mtt⟩
\DeclareFontFamily{U}{mtt}{\skewchar\font45}
\DeclareFontShape{U}{mtt}{b}{n}{<-7> mtmbf <7-9> mtmbs <9-> mtmbt}{}% (MJ)
⟨/Umtt | mtt⟩
```

6 The .fd file for LucidaNewMath-Symbols

The .fd file generated here should equal the one from FMi's mathtime bundle. Two alternative versions with KB-style or Y&Y-style font names are provided.

We need to adjust the size of the fonts, when they are used in conjunction with Times.

```
⟨*OMSlby⟩
\@ifundefined{LucidaScale}{\def\LucidaScale{0.9}}{}
\DeclareFontFamily{OMS}{lby}{\skewchar\font48}
⟨yy⟩ \DeclareFontShape{OMS}{lby}{m}{n}{<->s * [\LucidaScale]lbms}{}
⟨yy⟩ \DeclareFontShape{OMS}{lby}{b}{n}{<->s * [\LucidaScale]lbmns}{}
⟨kb⟩ \DeclareFontShape{OMS}{lby}{m}{n}{<->s * [\LucidaScale]hlcry}{}
⟨kb⟩ \DeclareFontShape{OMS}{lby}{b}{n}{<->s * [\LucidaScale]hlcdy}{}
⟨/OMSlby⟩
```

7 The `.fd` file for *MathTıme* Plus Script

The script alphabet from the *MathTıme* Plus font set may be useful in conjunction with *MathTımeProfessional*, too. The `.fd` file generated here should equal the one from FMi's mathtime bundle.

```
⟨*Umtms⟩
\DeclareFontFamily{U}{mtms}{\skewchar\font42}
\DeclareFontShape{U}{mtms}{m}{n}{<->mtms}{}
\DeclareFontShape{U}{mtms}{b}{n}{<->mtmsb}{}
⟨/Umtms⟩
```

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