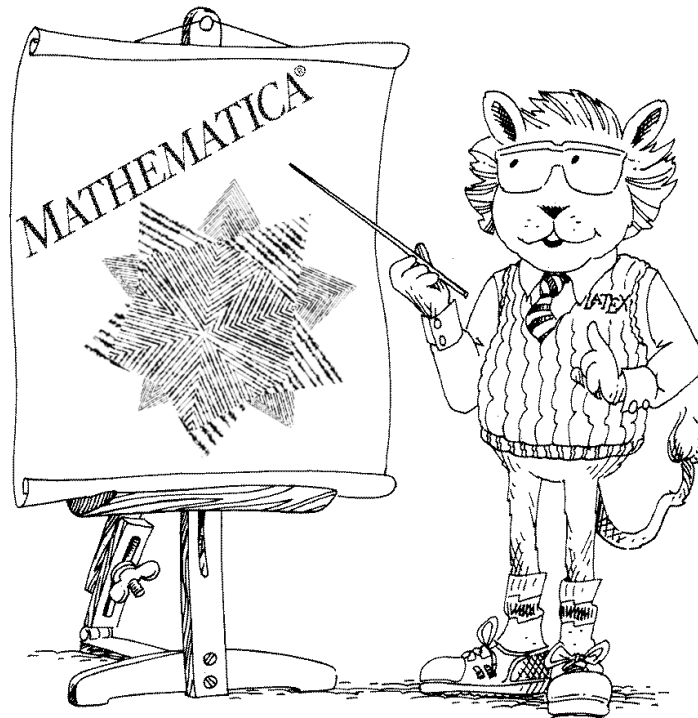


The *MATHEMATICA*[®] Virtual Font Package
MATHEMATICA[®] Fonts for L^AT_EX 2_ε
Version 2.0
Including CMTT Fonts



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1 Introduction

Mathematica comes with a full set of mathematical fonts in PostScript format. These fonts can be used to typeset mathematical texts in the standard PostScript font, Times-Roman. To use the fonts with \TeX and the macro package $\LaTeX 2_{\epsilon}$ [2], you need more than just the plain PostScript Type 1 fonts. \TeX must be given the dimensions of the characters and, for typesetting mathematics, \TeX needs the information on how to change the sizes of the operators and delimiters coded in the fonts [3].

\TeX normally uses the Computer Modern fonts. These fonts are generated by the METAFONT program. METAFONT produces bitmap fonts, which are optimized for the resolution of the output device. These bitmap fonts are included in the PostScript output as Type 3 fonts. When the PostScript file is printed on a device with a different resolution, the bitmap fonts are scaled and the high quality of the METAFONT output is lost. Most PostScript fonts are scalable-outline Type 1 fonts. The use of Type 1 fonts retains the resolution independence of the PostScript file. METAFONT cannot create Type 1 fonts, but most modern \TeX distributions come with Type 1 versions of the Computer Modern family.

Changing the text fonts to another font, like Times, produces a PostScript output with mixed Type 1 fonts in text and Computer Modern fonts in the mathematics mode. Since Computer Modern does not fit well with Times, you need mathematical fonts designed for use with Times. These fonts are typically available commercially. The problem is that \TeX 's mathematical fonts use characters from the fonts for ordinary text. Operators, such as $\sin x$ and $\log z$, use the operator font and the variables, like x , use the math-italic font. A new text font also needs new versions of \TeX 's operator and math-italic font, otherwise *italic* and *italic* use different fonts. To allow greater freedom of fonts for the text, the font package includes fonts to use with Times, Janson, and Adobe Garamond. For each base font, an operator and a math-italic font are included. The first font is a standard PostScript font, the next two are commercial fonts¹. *The Mathematica Journal* uses Janson as its text font and now the virtual fonts are included to generate a similar layout. The new package options `palatino`, `garamond`, and `janson` select the new text, operator, and math-italic fonts.

Since *Mathematica*'s input is traditionally typeset with monospaced fonts, the typesetting of *Mathematica* sessions needs monospaced mathematics fonts available only from the original *Mathematica* fonts. Additionally the *Mathematica* fonts offer more symbols than the traditional Computer Modern fonts. The symbols for natural, real, and complex numbers (\mathbb{N} , \mathbb{R} , and \mathbb{C}) are included, as well as path integrals, such as \oint_{Γ} , $f(z)$, dz , and surface integrals.

Mathematica's Type 1 fonts cannot be used directly with \TeX . There are some basic differences between Type 1 fonts and \TeX fonts. The most notable difference is that \TeX fonts include the information needed for mathematical typesetting. The \TeX metric files (*.tfm) include information on how extensible symbols are created from its pieces and how integral and sum signs are enlarged. The virtual font package adds this information and offers a set of macros to access the characters in the fonts.

A second monospaced font set called `MathCMTT` is used to typeset *The Mathematica*

¹To use the commercial fonts, you have to buy the Type 1 fonts from Adobe.

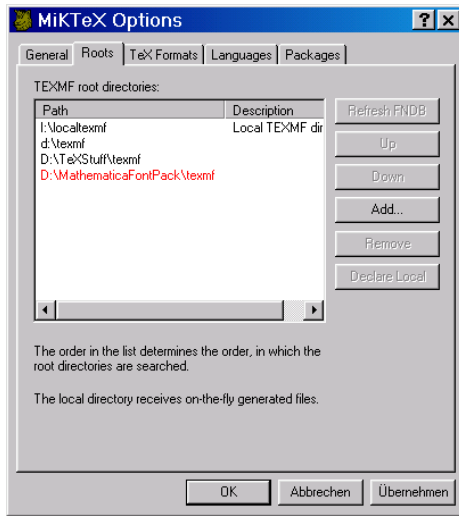


Figure 1: Add the path for the font package tree to the TDS root directories of MikTeX.

Book, besides the fonts that come with the *Mathematica* distribution. These fonts are narrower than the usual Courier/MathMono combination. This makes the fonts ideal for typesetting the two-column `In[]/Out[]` dialogs² in *The Mathematica book*. In addition to the mathematical symbols, the `MathCMTT` fonts also replace the standard typewriter font. The new option `cmTT` allows the usage of narrow `MathCMTT` fonts.

\TeX provides the virtual font mechanism to allow you to borrow characters from certain fonts and to assemble new ones. *Mathematica* has introduced some new symbols, such as $i = \sqrt{-1}$ and e for the base of the natural logarithm and the mathematical alphabets `DoubleStruck`, `Gothic`, and `Script` with lowercase letters. Similar mathematical alphabets can be found in the font sets of the American Mathematical Society (AMS). The virtual fonts, `w*.vf` and `w*.tfm`, and the style file, `wrisym.sty`, replace the standard Computer Modern fonts. The four mathematical fonts for operators, letters, symbols, and extensible symbols are replaced by the virtual fonts of the `w*` family. The first 128 characters of the new fonts conform to the standard \TeX encoding for mathematical fonts. Some of the slots with higher character codes are used for the new symbols. The main part of `wrisym.sty` deals with the setup of the new symbols.

The standard options will use Times-Roman and Helvetica, the `garamond` option uses Adobe Garamond and Optima, and the `janson` option uses Janson and Futura for text and sans serif text. The sans serif font is not used by the mathematical fonts and is only set to give a suggestion for the sans serif font in the document.

The virtual fonts were created with Alan Jeffrey's `fontinst` package [1].

² The font package itself offers no macros to create such dialogs. It contains only the character definitions.

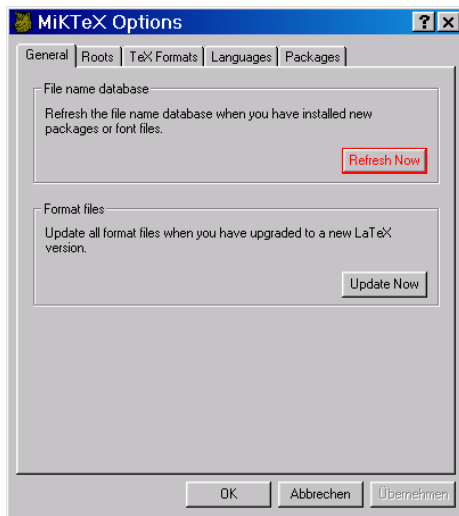


Figure 2: Refresh the file name data base.

2 Installation and Files

All the files come in a single archive file with a TDS (TeX Directory Structure) conform structure. MikTeX and TeTeX support multiple root directories for the TDS tree. The best way to install the font package is to unpack the archive file of the font pack and to add the expanded tree to the TDS root directories searched by your TeX installation.

2.1 MikTeX on a Windows System

Expand the archive in a folder like MathematicaFontPack. Open the MikTeX | MikTeX Options program, choose the Roots section, and add the directory MathematicaFontPack\texmf to the root directories (see Figure 1). Refresh the file name database (see Figure 2). Modify the config.ps file and the pdftex.cfg by adding the map files. For config.ps the section for the PostScript font mapping should look like this:

```
% An "all-in-one" psfonts.map.
p psfonts.map
% and the LaserWriter 35 fonts *not* in Acrobat. pdftex loads
% these differently
p +lw35extra.mapfile
p +wolfram.map
```

The config.ps file should be in the texmf\dvips\config directory. The configuration pdftex.cfg for pdftex must also be changed and should look like this:

```
pk_resolution 600
```

```

output_format 1
compress_level 9
decimal_digits 3
page_width 210 true mm
page_height 297 true mm
horigin 1 true in
vorigin 1 true in
map psfonts.map
map +pdfwolfram.map

```

The configuration file should be in `texmf\pdf\config`. Now this document should compile with `lATEX` and `pdflatex`.

For `fpTeX` on a Windows system, the instructions for `teTeX` should be used.

2.2 `teTeX` on a Unix System

`teTeX` also allows multiple TDS root directories. If the font package archive is expanded in `/usr/local/tex/MathematicaFontPack`, the new TDS root must be added to the `texmf.cfg` file. This file can be found in the `$TEXMF/texmf/web2c` directory. At the begin of the file the `TEXMF` variable is set. This part of the `texmf.cfg` file should be changed to look like this:

```

% Now, list all the texmf trees. If you have multiple trees,
% use shell brace notation, like this:
% TEXMF = {$HOMETEXMF,!!$VARTEXMF,!!$TEXMFLOCAL,!!$TEXMFMAIN}
% The braces are necessary.
%
% A place to store other TeX support files. Can be a remote
% texmf tree, or a tree to store non-free stuff, or ...
% TEXMFEXTRA=$SELFAUTOPARENT/texmf-extra
% If you set this, add $TEXMFEXTRA in the list below
%
% Define the tree with the font pack
WRITREE=/usr/local/tex/MathematicaFontPack/texmf
%
% Add the new TDS root to the TEXMF variable
TEXMF = {$HOMETEXMF,!!$WRITREE,$TEXMFLOCAL,!!$TEXMFMAIN}

```

Now the filename data base must be updated by a `texhash` or `texconfig rehash` command from the shell.

`teTeX` programs use the first configuration file in the TDS tree list. The font package comes with configuration files and, if you choose another position on the font package tree in the list `TEXMF`, you must add the map files in the configuration of `dvips` and `pdftex` in the TDS root that is scanned first.

2.3 Words of Caution

When the font package is used with MikTeX or with TeXLive some care must be taken to get a working installation.

The map files in the font pack also include the correct declarations of the old fonts. This may be a useful way to include figures generated by *Mathematica* 3.0–4.1 into TeX documents.

Both distributions come with a `psfonts.map` file that already includes the old *Mathematica* fonts. The map file in the TeXLive distribution uses lowercase characters for the font names. Since Unix file names are case sensitive, a TeXLive installation will not find the *Mathematica* fonts because the `psfonts.map` include lines like this:

```
Math1 Math1 <math1.pfb
:
```

All references to the mistyped font names must be removed from the `psfonts.map`, and the correct map file from the *Mathematica* virtual font distribution must be added as described above. To remove the false entries from the map file, you need root access to the TeX installation.

The case errors in the `psfonts.map` file that comes with MikTeX should have no effect, but it turns out that the multiple definitions of the font files in the MikTeX configuration and in the `wolfram.map` file create errors when MikTeX searches the fonts. All references to the *Mathematica* fonts must be removed from the `psfonts.map` that come with MikTeX .

This also applies to the `psfonts.map` file for `pdftex`. This file is in the configuration directory of `pdftex`.

The MikTeX distribution and the teTeX distribution come with a file `font-name/wolfram.map`. This file includes references to the virtual fonts created by Ulrik Vieth. These fonts are incomplete and the name of the map file will prevent the inclusion of the `wolfram.map` file that comes with the virtual font package. *This file must be deleted!*

2.4 More Details

To use the fonts, a DVI-driver that understands virtual fonts like `dvips`³ is needed. The common screen drivers, such as `xdvi` from teTeX ⁴ and `fpTeX` or `yap` from MikTeX , support virtual fonts.

The new fonts all start with the letter `w` for Wolfram Research. The combination with Times is indicated by the letters `tm`, Janson by the letters `jn`, Garamond by `ad`, the monospaced fonts with Courier by the letters `cr`, and the `MathCMTT` monospaced fonts by `tt`. The fourth letter corresponds to the font type: `r` for regular OT1 fonts, `m` for OML, `y` for OMS, or `v` for OMX. If the fifth letter is a `u`, it is the upright math-italic font. The final letter stands for the weight of the font: `m` for medium and `b` for bold. Therefore, the font `wttvm` is the `MathCMTT` font in OMX encoding with a medium weight.

³`dvipwindo` from Y&Y and the PCTeX driver do not support virtual fonts.

⁴www.tug.org/tetex/

Table 1: Metric files in the distribution.

wtm	r	mjb	OT1	Times operator
wtm	m	mjb	OML	Times math italic
wtm	y	mjb	OMS	Times symbol
wtm	v	mjb	OMX	Times math extensions
wjn	r	mjb	OT1	Janson operator
wjn	m	mjb	OML	Janson math italic
wad	r	mjb	OT1	Garamond operator
wad	m	mjb	OML	Garamond math italic
wcr	r	mjb	OT1	Courier operator
wcr	m	mjb	OML	Courier math italic
wcr	y	mjb	OMS	Courier symbol
wcr	v	mjb	OMX	Courier math extensions
wcru	m	mjb	OML	Courier math italic upright
wtt	r	mjb	OT1	Ma thCMTT operator
wtt	m	mjb	OML	Ma thCMTT math italic
wtt	y	mjb	OMS	Ma thCMTT symbol
wtt	v	mjb	OMX	Ma thCMTT math extensions
wttu	m	mv	OML	Ma thCMTT math italic upright
wsb		mjb	U	Keyboard and text symbols
wtt		r8t	T1	Ma thCMTT text font
wtt		ro8t	T1	Ma thCMTT italic text font
wtt		b8t	T1	Ma thCMTT text font
wtt		bo8t	T1	Ma thCMTT italic text font

\TeX needs the font metric files (*.tfm), the virtual fonts (*.vf), and the native font metric files from the *Mathematica* fonts (i.e., `Mathematica1.tfm`, `Mathematica2.tfm`, ...). $\LaTeX 2_{\epsilon}$ needs the font definition files `OT1w*r.fd`, `OMLw*m.fd`, `OMSw*y.fd`, and `OMXw*v.fd` to access the fonts. Additionally, the font definitions for the Times-Roman (`T1ptm.fd`), Helvetica (`T1phv.fd`), Courier fonts (`T1pcr.fd`), and `MathCMTT` (`T1wtt.fd`) are needed for the style file `wrisym.sty`. The first three files usually come with the $\LaTeX 2_{\epsilon}$ packages in the `psnfss` directory. If you need to combine with other fonts, such as Janson or Garamond, the metric files and virtual fonts are included in the corresponding parts of the directory tree. The commercial fonts (*.pfb) are not included and must be obtained from the font vendors.

A DVI driver creating PostScript output must be told to download the Type 1 *Mathematica* fonts. A typical line in this map file looks like this:

```
Mathematica1 Mathematica1 <Mathematica1.pfa
:
```

This map file includes the *Mathematica* fonts in your PostScript output. This is useful when the document needs to be printed on a system that does not have the *Mathematica* fonts installed. To reduce the file size, the driver should be forced to reencode the fonts. This removes unused glyphs from the fonts. For `dvips` and `pdftex` the reencoding is forced with the `-j0` option.

Leaving the fonts out of the PostScript file will minimize the file size. The PostScript file then contains references to the appropriate *Mathematica* fonts instead of the fonts themselves. However, only those who already have the *Mathematica* fonts available to their resident PostScript interpreter (a PostScript interpreter might be a copy of Ghostscript, a PostScript printer, or some other PostScript rasterizing system) will be able to correctly view your PostScript file. This behavior can be achieved by removing the last row in the map file, the lines should look like this:

```
Mathematica1 Mathematica1
:
```

2.5 Using Ghostscript

To setup the fonts for Ghostscript, Ghostscript must be told where the fonts can be found. This is usually done by setting/appending the directory with the *Mathematica* fonts (usually `/usr/local/mathematica/SystemFiles/Fonts/Type1`) to the `GS_LIB` environment variable in your login shell script.

Windows users can set the `GS_LIB` variable in the `autoexec.bat` file or in the advanced options of `GSView` (see Figure 3).

3 Using Fonts with $\LaTeX 2_{\epsilon}$

To use the package with your own files add the line

```
\usepackage{wrisym}
```

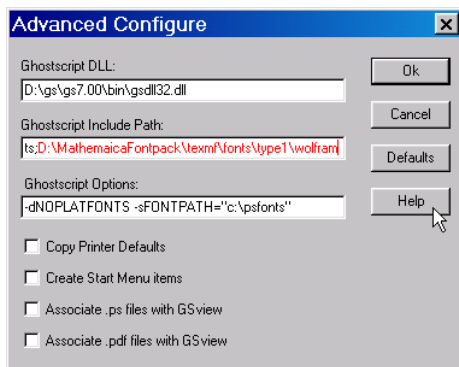


Figure 3: Set the search path for Ghostscript in GSView.

to the preamble of your $\LaTeX 2_{\epsilon}$ document.

If you get the font package from a *Mathematica* installation, you should copy the Type 1 fonts from *Mathematica*'s directory tree into a directory `fonts/type1/wolfram` in your local `texmf` tree. Then your \TeX installation is independent of the *Mathematica* installation and you will be able to translate your \TeX sources even when *Mathematica* is uninstalled or the installation directory is changed.

The style file has several options. It automatically loads the font encoding package and switches to the T1 encoding. The possible options for the package are:

`times` load the fonts with Times as base font. This is the default setting and should work with any PostScript printer. No additional fonts are needed.

`janson` load the fonts with Janson as base font. The Janson fonts from Adobe must be available to use this option.

`garamond` load the fonts with Adobe Garamond as base font. The Garamond fonts from Adobe must be available to use this option.

`monospacemath` declare the mathematics versions for monospaced mathematics like $\int_0^{\infty} \psi^*(x)\psi(x)x^2 dx$. These fonts are not loaded by default.

`cmtt` use the MathCMTT fonts for monospaced mathematics. This option also implies the `monospacemath` option.

`uprightmonomath` use upright letters instead of italic letters in monospaced mathematics. This option also implies the `monospacemath` option.

Apart from the production of bitmap-free \TeX output, you may use monospaced mathematical fonts. This is of limited interest in ordinary mathematical texts, but it is needed for typesetting the `In[]` and `Out[]` cells of *Mathematica* notebooks. For this purpose `wrisym.sty` introduces two new mathematical styles. The `wrisym.sty` package has an option `monospacemath`. If the package is loaded with

```
\usepackage[monospacemath]{wrisym}
```

then the monospaced fonts will be present and two new math versions are defined. For medium weight monospaced output, the `math-style mono` is introduced, and for bold monospaced mathematics, the `monobold` is introduced. By default the monospaced fonts will not be loaded.

Like the `\boldmath` or `\mathversion{bold}` (Figure 5), the commands `\monomath` or `\mathversion{mono}` (Figure 6) and `\monoboldmath` or `\mathversion{monobold}` (Figure 7) will switch to the new styles. Remember that the switch must be outside of a mathematical formula. The command `\mathversion{normal}` (Figure 4) will restore the default font set. Typesetting notebooks will require many more macros than `wrisym.sty` introduces.

One difference between the monospaced output and the fonts used for *The Mathematica Book* is that the variables are typeset in italics. This is the correct behavior for mathematics, but it looks strange for constructs like

$$\textit{Expand}[(x^2 + 1)^{100}]$$

The package also provides monospaced math-italic fonts with upright characters. The upright monospaced characters are loaded with the package option `uprightmonomath`.

When the narrower version of the monospaced fonts should be used to typeset a *Mathematica* session, the `cmtt` option should be given to the package. The `cmtt` option will define the monospaced mathematics styles.

4 Symbol Names

The *Mathematica* names, in most cases, are too long. The \TeX command for a symbol is the name of the corresponding AMS font symbol, if it exists, otherwise a *Mathematica* alias or name is used. Negated relations always start with the letter `n` and the \TeX or AMS- \TeX name follows. Even if it is not explicitly listed in the following tables, an alias in the *Mathematica* naming convention may exist.

The additional alphabets all work with the full *Mathematica* name; the aliases of the frontend; and the AMS font switching mechanism using `\mathcal{}` for script, `\mathfrak{}` for *Mathematica's* gothic, and `\mathbb{}` for double-struck characters. For single letters, you should use the alias of the front end because the macros for character replacement in the `\mathcal{}`, `\mathbb{}`, and `\mathfrak{}` commands are a bit time consuming.

5 Changes

Since the 1.0 release, I have fixed some bugs in the italic correction of the greek characters and the font dimension parameters. My thanks go to Ulrik Vieth and Jaiyong Lee (`jai@arctic.mit.edu`) for the bug reports.

Version 2.0 adds the support for `pdftex`, the options to use the `MathCMTT` fonts, and the combinations with Janson and Adobe Garamond. Since the new *Mathematica* fonts include some more glyphs, these new characters and symbols are added to the

The Dirac equation for a free particle:

$$i\hbar \frac{\partial \psi}{\partial t} = \hat{H}_f \psi = \left(\mathbf{c} \hat{\alpha} \hat{p} + m_0 \mathbf{c}^2 \hat{\beta} \right) \psi$$

The integral representation of Bessel function $J_\nu(z)$:

$$J_\nu(z) = \frac{1}{\pi} \int_0^\pi \cos(z \sin(\theta) - \nu \theta) d\theta - \frac{\sin(\nu\pi)}{\pi} \int_0^\infty e^{z \sinh t - \nu t} dt \quad (|\arg z| < \frac{1}{2}\pi)$$

The expansion of Coulomb wave functions in terms of Bessel-Clifford functions:

$$F_L(\eta, \varrho) = C_L(\eta) \frac{(2L+1)!}{(2\eta)^{2L+1}} \varrho^{-L} \sum_{k=2L+1}^{\infty} b_k t^{k/2} I_k(2\sqrt{t})$$

with $b_{2L+1} = 1$, $b_{2L+2} = 0$ and $4\eta^2 (k-2L) b_{k+1} + k b_{k-1} + b_{k-2} = 0$.

A radical identity:

$$\sqrt{\frac{1}{2}} \cdot \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2}}} \cdot \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2}}}} \cdots = \frac{2}{\pi}$$

$$p(R, \phi, \theta) \sim \rho \omega^2 e^{-i\pi/4} \sqrt{\frac{a}{2\pi^3 R \cos \phi}} \sum_{n=0}^{\infty} (-i)^n \cos(n\theta) \times \left\{ \int_{-\infty}^{\infty} \frac{\tilde{W}_n(\gamma) \exp \left[iR/a \left(\sqrt{k^2 a^2 - \gamma^2} \cos \phi + \gamma \sin \phi \right) \right]}{(k^2 a^2 - \gamma^2)^{3/4} H_n^{(1)'} \left(\sqrt{k^2 a^2 - \gamma^2} \right)} d\gamma \right\} \quad (1)$$

Figure 4: The normal mathematics style.

The Dirac equation for a free particle:

$$i\hbar \frac{\partial \psi}{\partial t} = \hat{H}_f \psi = \left(c \hat{\alpha} \hat{p} + m_0 c^2 \hat{\beta} \right) \psi$$

The integral representation of Bessel function $J_\nu(z)$:

$$J_\nu(z) = \frac{1}{\pi} \int_0^\pi \cos(z \sin(\theta) - \nu \theta) d\theta - \frac{\sin(\nu\pi)}{\pi} \int_0^\infty e^{z \sinh t - \nu t} dt \quad (|\arg z| < \frac{1}{2}\pi)$$

The expansion of Coulomb wave functions in terms of Bessel-Clifford functions:

$$F_L(\eta, \varrho) = C_L(\eta) \frac{(2L+1)!}{(2\eta)^{2L+1}} \varrho^{-L} \sum_{k=2L+1}^{\infty} b_k t^{k/2} I_k(2\sqrt{t})$$

with $b_{2L+1} = 1$, $b_{2L+2} = 0$ and $4\eta^2 (k - 2L) b_{k+1} + k b_{k-1} + b_{k-2} = 0$.

A radical identity:

$$\sqrt{\frac{1}{2}} \cdot \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2}}} \cdot \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2}}}} \cdots = \frac{2}{\pi}$$

$$p(R, \phi, \theta) \sim \rho \omega^2 e^{-i\pi/4} \sqrt{\frac{a}{2\pi^3 R \cos \phi}} \sum_{n=0}^{\infty} (-i)^n \cos(n\theta) \times \left\{ \int_{-\infty}^{\infty} \frac{\tilde{W}_n(\gamma) \exp \left[iR/a \left(\sqrt{k^2 a^2 - \gamma^2} \cos \phi + \gamma \sin \phi \right) \right]}{(k^2 a^2 - \gamma^2)^{3/4} H_n^{(1)'} \left(\sqrt{k^2 a^2 - \gamma^2} \right)} d\gamma \right\} \quad (2)$$

Figure 5: The bold mathematics style.

The Dirac equation for a free particle:

$$i\hbar \frac{\partial \psi}{\partial t} = \hat{H}_f \psi = \left(c \hat{\alpha} \hat{p} + m_0 c^2 \hat{\beta} \right) \psi$$

The integral representation of Bessel function $J_\nu(z)$:

$$J_\nu(z) = \frac{1}{\pi} \int_0^\pi \cos(z \sin(\theta) - \nu \theta) d\theta - \frac{\sin(\nu\pi)}{\pi} \int_0^\infty e^{z \sinh t - \nu t} dt \quad (|\arg z| < \frac{1}{2}\pi)$$

The expansion of Coulomb wave functions in terms of Bessel-Clifford functions:

$$F_L(\eta, \rho) = C_L(\eta) \frac{(2L+1)!}{(2\eta)^{2L+1}} \rho^{-L} \sum_{k=2L+1}^{\infty} b_k t^{k/2} I_k(2\sqrt{t})$$

with $b_{2L+1} = 1$, $b_{2L+2} = 0$ and $4\eta^2 (k-2L) b_{k+1} + k b_{k-1} + b_{k-2} = 0$.

A radical identity:

$$\sqrt{\frac{1}{2}} \cdot \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2}}} \cdot \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2}}}} \cdots = \frac{2}{\pi}$$

$$p(R, \phi, \theta) \sim \rho \omega^2 e^{-1\pi/4} \sqrt{\frac{a}{2\pi^3 R \cos \phi}} \sum_{n=0}^{\infty} (-1)^n \cos(n\theta) \times \left[\int_{-\infty}^{\infty} \frac{\tilde{W}_n(\gamma) \exp \left[iR/a \left(\sqrt{k^2 a^2 - \gamma^2} \cos \phi + \gamma \sin \phi \right) \right]}{(k^2 a^2 - \gamma^2)^{3/4} H_n^{(1)'} \left(\sqrt{k^2 a^2 - \gamma^2} \right)} d\gamma \right] \quad (3)$$

Figure 6: The mono mathematics style.

The Dirac equation for a free particle:

$$i\hbar \frac{\partial \psi}{\partial t} = \hat{H}_f \psi = (c \hat{\alpha} \hat{p} + m_0 c^2 \hat{\beta}) \psi$$

The integral representation of Bessel function $J_\nu(z)$:

$$J_\nu(z) = \frac{1}{\pi} \int_0^\pi \cos(z \sin(\theta) - \nu \theta) d\theta - \frac{\sin(\nu\pi)}{\pi} \int_0^\infty e^{z \sinh t - \nu t} dt \quad (|\arg z| < \frac{1}{2}\pi)$$

The expansion of Coulomb wave functions in terms of Bessel-Clifford functions:

$$F_L(\eta, \rho) = C_L(\eta) \frac{(2L+1)!}{(2\eta)^{2L+1}} \rho^{-L} \sum_{k=2L+1}^{\infty} b_k t^{k/2} I_k(2\sqrt{t})$$

with $b_{2L+1} = 1$, $b_{2L+2} = 0$ and $4\eta^2 (k-2L) b_{k+1} + k b_{k-1} + b_{k-2} = 0$.

A radical identity:

$$\sqrt{\frac{1}{2}} \cdot \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2}}} \cdot \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2}}}} \cdots = \frac{2}{\pi}$$

$$p(R, \phi, \theta) \sim \rho \omega^2 e^{-i\pi/4} \sqrt{\frac{a}{2\pi^3 R \cos \phi}} \sum_{n=0}^{\infty} (-1)^n \cos(n\theta) \times \left[\int_{-\infty}^{\infty} \frac{\tilde{W}_n(\gamma) \exp \left[iR/a \left(\sqrt{k^2 a^2 - \gamma^2} \cos \phi + \gamma \sin \phi \right) \right]}{(k^2 a^2 - \gamma^2)^{3/4} H_n^{(1)} \left(\sqrt{k^2 a^2 - \gamma^2} \right)} d\gamma \right] \quad (4)$$

Figure 7: The mono bold mathematics style.

fonts and to the style file. The most important additions are double-struck digits and the symbols for Euro currency (€) and logical operations.

6 Bug Reports

I have still some free positions in the virtual fonts. All users are asked to contribute requests for PostScript font symbols that are missed in the \TeX fonts.

The virtual fonts (spacing, italic correction, placement of super- and subscripts, and so on) as well as the style file, `wrisym.sty`, may still have some errors. Please report any bugs via email to:

kuska@informatik.uni-leipzig.de
fontpack@wolfram.com

Please start the subject line with “Mathematica Font Bug” and attach a $\LaTeX 2_{\epsilon}$ file that shows the error. I will try to fix any errors as soon as possible.

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Every effort has been made to produce correct and useful macros and fonts, in order to help promote computer science research and *Mathematica*, but no warranty of any kind should be assumed.

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The cover picture of the manual is a modified picture from Duane Bibby from the \LaTeX manual.

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Appendix: Character Tables

The following tables give the references for the defined characters and symbols when the `wrisym.sty` package is used.

Table 2: Additional characters.

Name	Alias	Normal	Bold
<code>\ee</code>	<code>\ExponetialeE</code>	e	\boldsymbol{e}
<code>\ii</code>	<code>\ComplexI</code>	i	\boldsymbol{i}
<code>\jj</code>	<code>\ComplexJ</code>	j	\boldsymbol{j}
<code>\dd</code>	<code>\DifferentialD</code>	d	\boldsymbol{d}
<code>\DD</code>	<code>\CapitalDifferentialD</code>	D	\boldsymbol{D}
<code>\DoublePi</code>		π	$\boldsymbol{\pi}$
<code>\EulerGamma</code>		γ	$\boldsymbol{\gamma}$
<code>\ScriptDotlessI</code>		ι	$\boldsymbol{\iota}$
<code>\ScriptDotlessJ</code>		J	\boldsymbol{J}
<code>\HBar</code>	<code>\hbar</code>	\hbar	$\boldsymbol{\hbar}$
<code>\Mho</code>		Ω	$\boldsymbol{\Omega}$
<code>\lambdaslash</code>		λ	$\boldsymbol{\lambda}$
<code>\Angstroem</code>		\AA	$\boldsymbol{\text{\AA}}$
<code>\beth</code>		\beth	$\boldsymbol{\beth}$
<code>\daleth</code>		\daleth	$\boldsymbol{\daleth}$
<code>\gimel</code>		\gimel	$\boldsymbol{\gimel}$
<code>\Digamma</code>		\D	$\boldsymbol{\text{\D}}$
<code>\Stigma</code>		\S	$\boldsymbol{\text{\S}}$
<code>\Koppa</code>		\K	$\boldsymbol{\text{\K}}$
<code>\Sampi</code>		\S	$\boldsymbol{\text{\S}}$
<code>\digamma</code>		\d	$\boldsymbol{\text{\d}}$
<code>\stigma</code>		\s	$\boldsymbol{\text{\s}}$
<code>\koppa</code>		\k	$\boldsymbol{\text{\k}}$
<code>\sampi</code>		\s	$\boldsymbol{\text{\s}}$
<code>\varkappa</code>		\varkappa	$\boldsymbol{\varkappa}$
<code>\Euler</code>	<code>\euler</code>	ϵ	$\boldsymbol{\epsilon}$
<code>\Micro</code>		μ	$\boldsymbol{\mu}$

Table 3: Script characters. You can use `\mathcal` to get several *Script* characters and digits *0123456789*.

<code>\ScriptZero</code>	<code>\scZero</code>	<i>0</i>	<code>\ScriptOne</code>	<code>\scOne</code>	<i>1</i>
<code>\ScriptTwo</code>	<code>\scTwo</code>	<i>2</i>	<code>\ScriptThree</code>	<code>\scThree</code>	<i>3</i>
<code>\ScriptFour</code>	<code>\scFour</code>	<i>4</i>	<code>\ScriptFive</code>	<code>\scFive</code>	<i>5</i>
<code>\ScriptSix</code>	<code>\scSix</code>	<i>6</i>	<code>\ScriptSeven</code>	<code>\scSeven</code>	<i>7</i>
<code>\ScriptEight</code>	<code>\scEight</code>	<i>8</i>	<code>\ScriptNine</code>	<code>\scNine</code>	<i>9</i>
<code>\ScriptCapitalA</code>	<code>\scA</code>	<i>A</i>	<code>\ScriptA</code>	<code>\sca</code>	<i>a</i>
<code>\ScriptCapitalB</code>	<code>\scB</code>	<i>B</i>	<code>\ScriptB</code>	<code>\scb</code>	<i>b</i>
<code>\ScriptCapitalC</code>	<code>\scC</code>	<i>C</i>	<code>\ScriptC</code>	<code>\scC</code>	<i>c</i>
<code>\ScriptCapitalD</code>	<code>\scD</code>	<i>D</i>	<code>\ScriptD</code>	<code>\scd</code>	<i>d</i>
<code>\ScriptCapitalE</code>	<code>\scE</code>	<i>E</i>	<code>\ScriptE</code>	<code>\sce</code>	<i>e</i>
<code>\ScriptCapitalF</code>	<code>\scF</code>	<i>F</i>	<code>\ScriptF</code>	<code>\scf</code>	<i>f</i>
<code>\ScriptCapitalG</code>	<code>\scG</code>	<i>G</i>	<code>\ScriptG</code>	<code>\scg</code>	<i>g</i>
<code>\ScriptCapitalH</code>	<code>\scH</code>	<i>H</i>	<code>\ScriptH</code>	<code>\sch</code>	<i>h</i>
<code>\ScriptCapitalI</code>	<code>\scI</code>	<i>I</i>	<code>\ScriptI</code>	<code>\sci</code>	<i>i</i>
<code>\ScriptCapitalJ</code>	<code>\scJ</code>	<i>J</i>	<code>\ScriptJ</code>	<code>\scj</code>	<i>j</i>
<code>\ScriptCapitalK</code>	<code>\scK</code>	<i>K</i>	<code>\ScriptK</code>	<code>\sck</code>	<i>k</i>
<code>\ScriptCapitalL</code>	<code>\scL</code>	<i>L</i>	<code>\ScriptL</code>	<code>\scl</code>	<i>l</i>
<code>\ScriptCapitalM</code>	<code>\scM</code>	<i>M</i>	<code>\ScriptM</code>	<code>\scm</code>	<i>m</i>
<code>\ScriptCapitalN</code>	<code>\scN</code>	<i>N</i>	<code>\ScriptN</code>	<code>\scn</code>	<i>n</i>
<code>\ScriptCapitalO</code>	<code>\scO</code>	<i>O</i>	<code>\ScriptO</code>	<code>\sco</code>	<i>o</i>
<code>\ScriptCapitalP</code>	<code>\scP</code>	<i>P</i>	<code>\ScriptP</code>	<code>\scP</code>	<i>p</i>
<code>\ScriptCapitalQ</code>	<code>\scQ</code>	<i>Q</i>	<code>\ScriptQ</code>	<code>\scq</code>	<i>q</i>
<code>\ScriptCapitalR</code>	<code>\scR</code>	<i>R</i>	<code>\ScriptR</code>	<code>\scr</code>	<i>r</i>
<code>\ScriptCapitalS</code>	<code>\scS</code>	<i>S</i>	<code>\ScriptS</code>	<code>\scs</code>	<i>s</i>
<code>\ScriptCapitalT</code>	<code>\scT</code>	<i>T</i>	<code>\ScriptT</code>	<code>\sct</code>	<i>t</i>
<code>\ScriptCapitalU</code>	<code>\scU</code>	<i>U</i>	<code>\ScriptU</code>	<code>\scu</code>	<i>u</i>
<code>\ScriptCapitalV</code>	<code>\scV</code>	<i>V</i>	<code>\ScriptV</code>	<code>\scv</code>	<i>v</i>
<code>\ScriptCapitalW</code>	<code>\scW</code>	<i>W</i>	<code>\ScriptW</code>	<code>\scw</code>	<i>w</i>
<code>\ScriptCapitalX</code>	<code>\scX</code>	<i>X</i>	<code>\ScriptX</code>	<code>\scx</code>	<i>x</i>
<code>\ScriptCapitalY</code>	<code>\scY</code>	<i>Y</i>	<code>\ScriptY</code>	<code>\scy</code>	<i>y</i>
<code>\ScriptCapitalZ</code>	<code>\scZ</code>	<i>Z</i>	<code>\ScriptZ</code>	<code>\scz</code>	<i>z</i>

Table 4: Double-struck characters. You can use `\mathbb` to get several DoubleStruck characters and double-struck numbers $\mathbb{0123456789}$.

<code>\DoubleStruckZero</code>	<code>\dsZero</code>	●	<code>\DoubleStruckOne</code>	<code>\dsOne</code>	1
<code>\DoubleStruckTwo</code>	<code>\dsTwo</code>	2	<code>\DoubleStruckThree</code>	<code>\dsThree</code>	3
<code>\DoubleStruckFour</code>	<code>\dsFour</code>	4	<code>\DoubleStruckFive</code>	<code>\dsFive</code>	5
<code>\DoubleStruckSix</code>	<code>\dsSix</code>	6	<code>\DoubleStruckSeven</code>	<code>\dsSeven</code>	7
<code>\DoubleStruckEight</code>	<code>\dsEight</code>	8	<code>\DoubleStruckNine</code>	<code>\dsNine</code>	9
<code>\DoubleStruckCapitalA</code>	<code>\dsA</code>	A	<code>\DoubleStruckA</code>	<code>\dsa</code>	a
<code>\DoubleStruckCapitalB</code>	<code>\dsB</code>	B	<code>\DoubleStruckB</code>	<code>\dsb</code>	b
<code>\DoubleStruckCapitalC</code>	<code>\dsC</code>	C	<code>\DoubleStruckC</code>	<code>\dsc</code>	c
<code>\DoubleStruckCapitalD</code>	<code>\dsD</code>	D	<code>\DoubleStruckD</code>	<code>\dsd</code>	d
<code>\DoubleStruckCapitalE</code>	<code>\dsE</code>	E	<code>\DoubleStruckE</code>	<code>\dse</code>	e
<code>\DoubleStruckCapitalF</code>	<code>\dsF</code>	F	<code>\DoubleStruckF</code>	<code>\dsf</code>	f
<code>\DoubleStruckCapitalG</code>	<code>\dsG</code>	G	<code>\DoubleStruckG</code>	<code>\dsg</code>	g
<code>\DoubleStruckCapitalH</code>	<code>\dsH</code>	H	<code>\DoubleStruckH</code>	<code>\dsh</code>	h
<code>\DoubleStruckCapitalI</code>	<code>\dsI</code>	I	<code>\DoubleStruckI</code>	<code>\dsi</code>	i
<code>\DoubleStruckCapitalJ</code>	<code>\dsJ</code>	J	<code>\DoubleStruckJ</code>	<code>\dsj</code>	j
<code>\DoubleStruckCapitalK</code>	<code>\dsK</code>	K	<code>\DoubleStruckK</code>	<code>\dsk</code>	k
<code>\DoubleStruckCapitalL</code>	<code>\dsL</code>	L	<code>\DoubleStruckL</code>	<code>\dsl</code>	l
<code>\DoubleStruckCapitalM</code>	<code>\dsM</code>	M	<code>\DoubleStruckM</code>	<code>\dsm</code>	m
<code>\DoubleStruckCapitalN</code>	<code>\dsN</code>	N	<code>\DoubleStruckN</code>	<code>\dsn</code>	n
<code>\DoubleStruckCapitalO</code>	<code>\dsO</code>	O	<code>\DoubleStruckO</code>	<code>\dso</code>	o
<code>\DoubleStruckCapitalP</code>	<code>\dsP</code>	P	<code>\DoubleStruckP</code>	<code>\dsp</code>	p
<code>\DoubleStruckCapitalQ</code>	<code>\dsQ</code>	Q	<code>\DoubleStruckQ</code>	<code>\dsq</code>	q
<code>\DoubleStruckCapitalR</code>	<code>\dsR</code>	R	<code>\DoubleStruckR</code>	<code>\dsr</code>	r
<code>\DoubleStruckCapitalS</code>	<code>\dsS</code>	S	<code>\DoubleStruckS</code>	<code>\dss</code>	s
<code>\DoubleStruckCapitalT</code>	<code>\dsT</code>	T	<code>\DoubleStruckT</code>	<code>\dst</code>	t
<code>\DoubleStruckCapitalU</code>	<code>\dsU</code>	U	<code>\DoubleStruckU</code>	<code>\dsu</code>	u
<code>\DoubleStruckCapitalV</code>	<code>\dsV</code>	V	<code>\DoubleStruckV</code>	<code>\dsv</code>	v
<code>\DoubleStruckCapitalW</code>	<code>\dsW</code>	W	<code>\DoubleStruckW</code>	<code>\dsw</code>	w
<code>\DoubleStruckCapitalX</code>	<code>\dsX</code>	X	<code>\DoubleStruckX</code>	<code>\dsx</code>	x
<code>\DoubleStruckCapitalY</code>	<code>\dsY</code>	Y	<code>\DoubleStruckY</code>	<code>\dsy</code>	y
<code>\DoubleStruckCapitalZ</code>	<code>\dsZ</code>	Z	<code>\DoubleStruckZ</code>	<code>\dsz</code>	z

Table 5: Gothic characters. You can use `\mathfrak` to get Gothic characters.

<code>\GothicCapitalA</code>	<code>\goA</code>	A	A	<code>\GothicA</code>	<code>\goa</code>	a	a
<code>\GothicCapitalB</code>	<code>\goB</code>	B	B	<code>\GothicB</code>	<code>\gob</code>	b	b
<code>\GothicCapitalC</code>	<code>\goC</code>	C	C	<code>\GothicC</code>	<code>\goc</code>	c	c
<code>\GothicCapitalD</code>	<code>\goD</code>	D	D	<code>\GothicD</code>	<code>\god</code>	d	d
<code>\GothicCapitalE</code>	<code>\goE</code>	E	E	<code>\GothicE</code>	<code>\goe</code>	e	e
<code>\GothicCapitalF</code>	<code>\goF</code>	F	F	<code>\GothicF</code>	<code>\gof</code>	f	f
<code>\GothicCapitalG</code>	<code>\goG</code>	G	G	<code>\GothicG</code>	<code>\gog</code>	g	g
<code>\GothicCapitalH</code>	<code>\goH</code>	H	H	<code>\GothicH</code>	<code>\goh</code>	h	h
<code>\GothicCapitalI</code>	<code>\goI</code>	I	I	<code>\GothicI</code>	<code>\goi</code>	i	i
<code>\GothicCapitalJ</code>	<code>\goJ</code>	J	J	<code>\GothicJ</code>	<code>\goj</code>	j	j
<code>\GothicCapitalK</code>	<code>\goK</code>	K	K	<code>\GothicK</code>	<code>\gok</code>	k	k
<code>\GothicCapitalL</code>	<code>\goL</code>	L	L	<code>\GothicL</code>	<code>\gol</code>	l	l
<code>\GothicCapitalM</code>	<code>\goM</code>	M	M	<code>\GothicM</code>	<code>\gom</code>	m	m
<code>\GothicCapitalN</code>	<code>\goN</code>	N	N	<code>\GothicN</code>	<code>\gon</code>	n	n
<code>\GothicCapitalO</code>	<code>\goO</code>	O	O	<code>\GothicO</code>	<code>\goo</code>	o	o
<code>\GothicCapitalP</code>	<code>\goP</code>	P	P	<code>\GothicP</code>	<code>\gop</code>	p	p
<code>\GothicCapitalQ</code>	<code>\goQ</code>	Q	Q	<code>\GothicQ</code>	<code>\goq</code>	q	q
<code>\GothicCapitalR</code>	<code>\goR</code>	R	R	<code>\GothicR</code>	<code>\gor</code>	r	r
<code>\GothicCapitalS</code>	<code>\goS</code>	S	S	<code>\GothicS</code>	<code>\gos</code>	s	s
<code>\GothicCapitalT</code>	<code>\goT</code>	T	T	<code>\GothicT</code>	<code>\got</code>	t	t
<code>\GothicCapitalU</code>	<code>\goU</code>	U	U	<code>\GothicU</code>	<code>\gou</code>	u	u
<code>\GothicCapitalV</code>	<code>\goV</code>	V	V	<code>\GothicV</code>	<code>\gov</code>	v	v
<code>\GothicCapitalW</code>	<code>\goW</code>	W	W	<code>\GothicW</code>	<code>\gow</code>	w	w
<code>\GothicCapitalX</code>	<code>\goX</code>	X	X	<code>\GothicX</code>	<code>\gox</code>	x	x
<code>\GothicCapitalY</code>	<code>\goY</code>	Y	Y	<code>\GothicY</code>	<code>\goy</code>	y	y
<code>\GothicCapitalZ</code>	<code>\goZ</code>	Z	Z	<code>\GothicZ</code>	<code>\goz</code>	z	z

Table 6: Integral signs.

$\text{T}_{\text{E}}\text{X}$ -Command			
$\backslash\text{int}$	\int	$\int_a^b f(x) dx$	$\int_a^b f(x) dx$
		$\int_a^b f(x) dx$	$\int_a^b f(x) dx$
$\backslash\text{oint}$	\oint	$\oint_C f(\zeta) d\zeta$	$\oint_C f(\zeta) d\zeta$
		$\oint_C f(\zeta) d\zeta$	$\oint_C f(\zeta) d\zeta$
$\backslash\text{dbloint}$	\iint	$\iint_{\Gamma} f(u, v) du dv$	$\iint_{\Gamma} f(u, v) du dv$
		$\iint_{\Gamma} f(u, v) du dv$	$\iint_{\Gamma} f(u, v) du dv$
$\backslash\text{clockoint}$	\oint	$\oint_{\Gamma} f(z) dz$	$\oint_{\Gamma} f(z) dz$
		$\oint_{\Gamma} f(z) dz$	$\oint_{\Gamma} f(z) dz$
$\backslash\text{cntclockoint}$	\oint	$\oint_{\Gamma} f(z) dz$	$\oint_{\Gamma} f(z) dz$
		$\oint_{\Gamma} f(z) dz$	$\oint_{\Gamma} f(z) dz$
$\backslash\text{sqrnt}$	\oint	$\oint_{\Gamma} f(z) dz$	$\oint_{\Gamma} f(z) dz$
		$\oint_{\Gamma} f(z) dz$	$\oint_{\Gamma} f(z) dz$
$\backslash\text{fint}$	\int	$\int_{-\infty}^{\infty} \frac{f(x)}{x} dx$	$\int_{-\infty}^{\infty} \frac{f(x)}{x} dx$
		$\int_{-\infty}^{\infty} \frac{f(x)}{x} dx$	$\int_{-\infty}^{\infty} \frac{f(x)}{x} dx$

Table 7: Logical operators.

TeX-Command			
\bigvee	\vee	$\bigvee_{i=0}^n q_i$	$\bigvee_{i=0}^n q_i$
		$\bigvee_{i=0}^n \mathbf{q}_i$	$\bigvee_{i=0}^n \mathbf{q}_i$
\bigwedge	\wedge	$\bigwedge_{i=0}^n q_i$	$\bigwedge_{i=0}^n q_i$
		$\bigwedge_{i=0}^n \mathbf{q}_i$	$\bigwedge_{i=0}^n \mathbf{q}_i$
\And	\wedge	$\bigwedge_{i=0}^n q_i$	$\bigwedge_{i=0}^n q_i$
		$\bigwedge_{i=0}^n \mathbf{q}_i$	$\bigwedge_{i=0}^n \mathbf{q}_i$
\Or	\vee	$\bigvee_{i=0}^n q_i$	$\bigvee_{i=0}^n q_i$
		$\bigvee_{i=0}^n \mathbf{q}_i$	$\bigvee_{i=0}^n \mathbf{q}_i$
\Nand	$\bar{\wedge}$	$\bar{\bigwedge}_{i=0}^n q_i$	$\bar{\bigwedge}_{i=0}^n q_i$
		$\bar{\bigwedge}_{i=0}^n \mathbf{q}_i$	$\bar{\bigwedge}_{i=0}^n \mathbf{q}_i$
\Nor	$\bar{\vee}$	$\bar{\bigvee}_{i=0}^n q_i$	$\bar{\bigvee}_{i=0}^n q_i$
		$\bar{\bigvee}_{i=0}^n \mathbf{q}_i$	$\bar{\bigvee}_{i=0}^n \mathbf{q}_i$
\Xor	$\underline{\vee}$	$\underline{\bigvee}_{i=0}^n q_i$	$\underline{\bigvee}_{i=0}^n q_i$
		$\underline{\bigvee}_{i=0}^n \mathbf{q}_i$	$\underline{\bigvee}_{i=0}^n \mathbf{q}_i$

Table 8: Additional and changed arrows 1.

<code>\HookLeftArrow</code>	\hookrightarrow	$a \hookrightarrow b$
<code>\HookRightArrow</code>	\hookleftarrow	$a \hookleftarrow b$
<code>\MapsTo</code>	\mapsto	$a \mapsto b$
<code>\MapsFrom</code>	\mapleftarrow	$a \mapleftarrow b$
<code>\MapsUp</code>	\Uparrow	$\Uparrow \Uparrow \Uparrow \Uparrow$
<code>\MapsDown</code>	\Downarrow	$\Downarrow \Downarrow \Downarrow \Downarrow$
<code>\ShortUpArrow</code>	\uparrow	$a \uparrow b$
<code>\ShortDownArrow</code>	\downarrow	$a \downarrow b$
<code>\ShortRightArrow</code>	\rightarrow	$a \rightarrow b$
<code>\ShortLeftArrow</code>	\leftarrow	$a \leftarrow b$
<code>\LongLeftArrow</code>	\longleftarrow	$a \longleftarrow b$
<code>\longleftarrow</code>	\longleftarrow	$a \longleftarrow b$
<code>\LongRightArrow</code>	\longrightarrow	$a \longrightarrow b$
<code>\longrightarrow</code>	\longrightarrow	$a \longrightarrow b$
<code>\LongLeftRightArrow</code>	\longleftrightarrow	$a \longleftrightarrow b$
<code>\longleftarrowrightarrow</code>	\longleftrightarrow	$a \longleftrightarrow b$
<code>\DbgLongLeftArrow</code>	\Lleftarrow	$a \Lleftarrow b$
<code>\Llongleftarrow</code>	\Lleftarrow	$a \Lleftarrow b$
<code>\DbgLongRightArrow</code>	\Rrightarrow	$a \Rrightarrow b$
<code>\Rlongrightarrow</code>	\Rrightarrow	$a \Rrightarrow b$
<code>\DbgLongLeftRightArrow</code>	\Lleftrightarrow	$a \Lleftrightarrow b$
<code>\Llongleftrightarrow</code>	\Lleftrightarrow	$a \Lleftrightarrow b$

Table 9: Additional and changed arrows 2.

<code>\RightVectorBar</code>	\rightarrow	$a \rightarrow b$
<code>\LeftVectorBar</code>	\leftarrow	$a \leftarrow b$
<code>\DownRightVectorBar</code>	\searrow	$a \searrow b$
<code>\DownLeftVectorBar</code>	\swarrow	$a \swarrow b$
<code>\RightTeeVector</code>	\mapsto	$a \mapsto b$
<code>\LeftTeeVector</code>	\mapsto	$a \mapsto b$
<code>\DownRightTeeVector</code>	\mapsto	$a \mapsto b$
<code>\DownLeftTeeVector</code>	\mapsto	$a \mapsto b$
<code>\RightArrowBar</code>	\rightarrow	$a \rightarrow b$
<code>\LeftArrowBar</code>	\leftarrow	$a \leftarrow b$
<code>\leftrightharpoonup</code>	\Leftrightarrow	$a \Leftrightarrow b$
<code>\leftrightharpoondown</code>	\Leftrightarrow	$a \Leftrightarrow b$
<code>\equilibrium</code>	\rightleftharpoons	$a \rightleftharpoons b$
<code>\revequilibrium</code>	\rightleftharpoons	$a \rightleftharpoons b$
<code>\Equilibrium</code>	\rightleftharpoons	$a \rightleftharpoons b$
<code>\RevEquilibrium</code>	\rightleftharpoons	$a \rightleftharpoons b$
<code>\upharpoonleftup</code>	\uparrow	$\uparrow \uparrow \uparrow \uparrow$
<code>\upharpoonleftdown</code>	\downarrow	$\downarrow \downarrow \downarrow \downarrow$
<code>\upharpoonrightup</code>	\uparrow	$\uparrow \uparrow \uparrow \uparrow$
<code>\upharpoonrightdown</code>	\downarrow	$\downarrow \downarrow \downarrow \downarrow$
<code>\leftupdownharpoon</code>	\updownarrow	$\updownarrow \updownarrow \updownarrow \updownarrow$
<code>\rightupdownharpoon</code>	\updownarrow	$\updownarrow \updownarrow \updownarrow \updownarrow$
<code>\UpArrowBar</code>	\Uparrow	$\Uparrow \Uparrow \Uparrow \Uparrow$
<code>\DownArrowBar</code>	\Downarrow	$\Downarrow \Downarrow \Downarrow \Downarrow$

Table 10: Additional and changed arrows 3.

<code>\LeftUpTeeVector</code>	\lrcorner	
<code>\RightUpTeeVector</code>	\llcorner	
<code>\LeftDownTeeVector</code>	\lrcorner	
<code>\RightDownTeeVector</code>	\llcorner	
<code>\LeftUpVectorBar</code>	\Uparrow	
<code>\RightUpVectorBar</code>	\Uparrow	
<code>\LeftDownVectorBar</code>	\Downarrow	
<code>\RightDownVectorBar</code>	\Downarrow	
<code>\upequilibrium</code>	\rightleftharpoons	
<code>\uprewequilibrium</code>	\rightleftharpoons	
<code>\rightleftarrow</code>	\rightleftarrows	$a \rightleftarrows b$
<code>\leftrightarrow</code>	\leftrightarrows	$a \leftrightarrows b$
<code>\uparrowdownarrow</code>	\Updownarrow	
<code>\downarrowuparrow</code>	\Updownarrow	

Table 11: Extensible horizontal arrows. All arrows have a length argument.

TeX command	Symbol	Example
<code>\RightArrowFill[length]</code>	\rightarrow	$a \longrightarrow b$
<code>\LeftArrowFill[length]</code>	\leftarrow	$a \longleftarrow b$
<code>\LRArrowFill[length]</code>	\leftrightarrow	$a \longleftrightarrow b$
<code>\DbLRightArrowFill[length]</code>	\Longrightarrow	$a \Longrightarrow b$
<code>\DbLLeftArrowFill[length]</code>	\Leftarrow	$a \Leftarrow b$
<code>\DbLLRArrowFill[length]</code>	\Leftrightarrow	$a \Leftrightarrow b$
<code>\RightHarpoonUpFill[length]</code>	\rightarrow	$a \longrightarrow b$
<code>\LeftHarpoonUpFill[length]</code>	\leftarrow	$a \longleftarrow b$
<code>\RightHarpoonDownFill[length]</code>	\rightarrow	$a \longrightarrow b$
<code>\LeftHarpoonDownFill[length]</code>	\leftarrow	$a \longleftarrow b$
<code>\LRHarpoonUpFill[length]</code>	\leftrightarrow	$a \longleftrightarrow b$
<code>\LRHarpoonDownFill[length]</code>	\leftrightarrow	$a \longleftrightarrow b$
<code>\EquilibriumFill[length]</code>	\rightleftharpoons	$a \rightleftharpoons b$
<code>\RevEquilibriumFill[length]</code>	\leftrightharpoons	$a \leftrightharpoons b$
<code>\RightLeftArrowFill[length]</code>	\rightleftarrows	$a \rightleftarrows b$
<code>\LeftRightArrowFill[length]</code>	\leftrightarrows	$a \leftrightarrows b$

Table 12: Dots as time derivatives.

<code>\Dot</code>	$\dot{a}(t)$	$\dot{\mathbf{a}}(t)$
<code>\DDot</code>	$\ddot{a}(t)$	$\ddot{\mathbf{a}}(t)$
<code>\DDDot</code>	$\dddot{a}(t)$	$\dddot{\mathbf{a}}(t)$
<code>\vec</code>	\vec{A}	$\vec{\mathbf{A}}$
<code>\lrvec</code>	\overrightarrow{A}	$\overrightarrow{\mathbf{A}}$
<code>\lvec</code>	\overleftarrow{A}	$\overleftarrow{\mathbf{A}}$
<code>\Vec</code>	\overleftrightarrow{A}	$\overleftrightarrow{\mathbf{A}}$
<code>\LRVec</code>	\overleftrightarrow{A}	$\overleftrightarrow{\mathbf{A}}$
<code>\LVec</code>	\overleftarrow{A}	$\overleftarrow{\mathbf{A}}$

Table 13: Over- and underbraces, brackets, and so on.

$\overparen{argument}$ $\underparen{argument}$	$\overline{a+b}$ $\underline{a+b}$	$\overline{a+b+c}$ $\underline{a+b+c}$	$\overline{a+b+x+y}$ $\underline{a+b+x+y}$
$\overbracket{argument}$ $\underbracket{argument}$	$\overline{a+b}$ $\underline{a+b}$	$\overline{a+b+c}$ $\underline{a+b+c}$	$\overline{a+b+x+y}$ $\underline{a+b+x+y}$
$\OverBracket{argument}$ $\UnderBracket{argument}$	$\overline{a+b}$ $\underline{a+b}$	$\overline{a+b+c}$ $\underline{a+b+c}$	$\overline{a+b+x+y}$ $\underline{a+b+x+y}$
$\overbrace{argument}$ $\underbrace{argument}$	$\overline{a+b}$ $\underline{a+b}$	$\overline{a+b+c}$ $\underline{a+b+c}$	$\overline{a+b+x+y}$ $\underline{a+b+x+y}$
$\overleftarrow{argument}$ $\overrightarrow{argument}$	$\overleftarrow{a+b}$ $\overrightarrow{a+b}$	$\overleftarrow{a+b+c}$ $\overrightarrow{a+b+c}$	$\overleftarrow{a+b+x+y}$ $\overrightarrow{a+b+x+y}$
$\overleftharpoonup{argument}$ $\overrightarrow{argument}$	$\overleftarrow{a+b}$ $\overrightarrow{a+b}$	$\overleftarrow{a+b+c}$ $\overrightarrow{a+b+c}$	$\overleftarrow{a+b+x+y}$ $\overrightarrow{a+b+x+y}$
$\overleftharpoonup{argument}$ $\overrightarrow{argument}$	$\overleftarrow{a+b}$ $\overrightarrow{a+b}$	$\overleftarrow{a+b+c}$ $\overrightarrow{a+b+c}$	$\overleftarrow{a+b+x+y}$ $\overrightarrow{a+b+x+y}$
$\overleftarrow{argument}$ $\overrightarrow{argument}$	$\overleftarrow{a+b}$ $\overrightarrow{a+b}$	$\overleftarrow{a+b+c}$ $\overrightarrow{a+b+c}$	$\overleftarrow{a+b+x+y}$ $\overrightarrow{a+b+x+y}$

Table 14: Relations and negated binary relations 1.

<code>\therefore</code>	$a \therefore b$
<code>\because</code>	$a \because b$
<code>\Proportion</code>	$a \propto b$
<code>\neq</code>	$a \neq b$
<code>\dotequal</code>	$a \doteq b$
<code>\nasymp</code>	$a \asymp b$
<code>\nequiv</code>	$a \nequiv b$
<code>\nsupseteq</code>	$a \not\supseteq b$
<code>\nsubseteq</code>	$a \not\subseteq b$
<code>\nsqsupseteq</code>	$a \not\sqsupseteq b$
<code>\nsqsubseteq</code>	$a \not\sqsubseteq b$
<code>\nleq</code>	$a \nleq b$
<code>\ngeq</code>	$a \ngeq b$
<code>\npreceq</code>	$a \npreceq b$
<code>\nsucceq</code>	$a \nsucceq b$
<code>\nsim</code>	$a \nsim b$
<code>\cong</code>	$a \cong b$
<code>\ncong</code>	$a \ncong b$
<code>\napprox</code>	$a \napprox b$
<code>\subset</code>	$a \subset b$
<code>\nsupset</code>	$a \not\supset b$
<code>\nll</code>	$a \ll b$
<code>\ngg</code>	$a \gg b$
<code>\nprec</code>	$a \nprec b$
<code>\nsucc</code>	$a \nsucc b$
<code>\nin</code>	$a \notin b$
<code>\nni</code>	$a \not\ni b$
<code>\nless</code>	$a \nless b$
<code>\ngtr</code>	$a \ngtr b$
<code>\bumpeq</code>	$a \bumpeq b$
<code>\Bumpeq</code>	$a \Bumpeq b$
<code>\nbumpeq</code>	$a \not\bumpeq b$
<code>\nBumpeq</code>	$a \not\Bumpeq b$
<code>\NotVerticalBar</code>	$a \nVdash b$
<code>\NotDoubleVerticalBar</code>	$a \nVVDash b$

Table 15: Relations and negated binary relations 2.

<code>\unlhd</code>	$a \trianglelefteq b$
<code>\unrhd</code>	$a \trianglerighteq b$
<code>\nunlhd</code>	$a \not\trianglelefteq b$
<code>\nunrhd</code>	$a \not\trianglerighteq b$
<code>\backepsilon</code>	$a \ni b$
<code>\TildeEqual</code>	$a \approx b$
<code>\NotTildeEqual</code>	$a \not\approx b$
<code>\NestedLessLess</code>	$a \ll b$
<code>\NotNestedLessLess</code>	$a \not\ll b$
<code>\NestedGreaterGreater</code>	$a \gg b$
<code>\NotNestedGreaterGreater</code>	$a \not\gg b$
<code>\GreaterLess</code>	$a \leq b$
<code>\NotGreaterLess</code>	$a \not\leq b$
<code>\GreaterTilde</code>	$a \gtrsim b$
<code>\LessTilde</code>	$a \lesssim b$
<code>\NotGreaterTilde</code>	$a \not\gtrsim b$
<code>\NotLessTilde</code>	$a \not\lesssim b$
<code>\PrecedesSlantEqual</code>	$a \preceq b$
<code>\SucceedsSlantEqual</code>	$a \succeq b$
<code>\NotPrecedesSlantEqual</code>	$a \not\preceq b$
<code>\NotSucceedsSlantEqual</code>	$a \not\succeq b$
<code>\PrecedesTilde</code>	$a \precsim b$
<code>\SucceedsTilde</code>	$a \succsim b$
<code>\NotPrecedesTilde</code>	$a \not\precsim b$
<code>\NotSucceedsTilde</code>	$a \not\succsim b$
<code>\RightTriangle</code>	$a \triangleright b$
<code>\LeftTriangle</code>	$a \triangleleft b$
<code>\NotRightTriangle</code>	$a \not\triangleright b$
<code>\NotLeftTriangle</code>	$a \not\triangleleft b$
<code>\RightTriangleBar</code>	$a \triangleright\! b$
<code>\LeftTriangleBar</code>	$a \triangleleft\! b$
<code>\NotRightTriangleBar</code>	$a \not\triangleright\! b$
<code>\NotLeftTriangleBar</code>	$a \not\triangleleft\! b$
<code>\LessFullEqual</code>	$a \leqq b$
<code>\GreaterFullEqual</code>	$a \geqq b$
<code>\NotLessFullEqual</code>	$a \not\leqq b$
<code>\NotGreaterFullEqual</code>	$a \not\geqq b$
<code>\LessEqualGreater</code>	$a \lesseqgtr b$
<code>\GreaterEqualLess</code>	$a \gtrseqless b$

Table 16: Angle.

Name	Alias	normal	bold
<code>\Angle</code>	<code>\angle</code>	∠	∠
<code>\rightangle</code>	<code>\RightAngle</code>	⊥	⊥
<code>\measuredangle</code>	<code>\MeasuredAngle</code>	∠	∠
<code>\sphericalangle</code>	<code>\SphericalAngle</code>	∠	∠

Table 17: Text symbols. The text symbols are all defined with a closing `\xspace`.

<code>\MathLogo</code>	MATHEMATICA®	<code>\MathIcon</code>	☸
<code>\KernelIcon</code>	☸	<code>\Wolf</code>	🐺
<code>\WatchIcon</code>	🕒	<code>\LightBulb</code>	💡
<code>\HappySmiley</code>	😊	<code>\NeutralSmiley</code>	😐
<code>\SadSmiley</code>	😞	<code>\FreakedSmiley</code>	😱
<code>\WarningSign</code>	⚠	<code>\AliasDelimiter</code>	⋮
<code>\male</code>	♂	<code>\female</code>	♀
<code>\CommandKey</code>	⌨	<code>\ControlKey</code>	⌘
<code>\AltKey</code>	⌥	<code>\ModeOneKey</code>	⌂
<code>\ModeTwoKey</code>	⌘	<code>\CloverLeaf</code>	☘
<code>\ReturnIndicator</code>	↵	<code>\DottedSquare</code>	◻
<code>\LeftModified</code>	⌞	<code>\RightModified</code>	⌟
<code>\EscapeKey</code>	⌨	<code>\ReturnKey</code>	⏎
<code>\ShiftKey</code>	⇧	<code>\SpaceKey</code>	␣
<code>\BackspaceKey</code>	⌫	<code>\HomeKey</code>	⌵
<code>\PageUpKey</code>	⏶	<code>\PageDownKey</code>	⏷
<code>\EndKey</code>	⏹	<code>\TabKey</code>	⌵
<code>\GoToFirstPage</code>		<code>\GoToLastPage</code>	
<code>\GoToPreviousPage</code>		<code>\GoToNextPage</code>	
<code>\FilledUpTriangle</code>	▲	<code>\EmptyUpTriangle</code>	△
<code>\FilledDownTriangle</code>	▼	<code>\EmptyDownTriangle</code>	▽
<code>\FilledDiamond</code>	◆	<code>\EmptyDiamond</code>	◇
<code>\FilledSquare</code>	■	<code>\EmptySquare</code>	□
<code>\FilledSmallSquare</code>	▪	<code>\EmptySmallSquare</code>	◻
<code>\euro</code>	€	<code>\sterling</code>	£
<code>\cent</code>	¢	<code>\yen</code>	¥
<code>\DownQuestion</code>	¿		

Table 18: Shapes and icons in math and text mode.













































<code>\SpaceIndicator</code>		
<code>\RoundSpaceIndicator</code>		
<code>\Continuation</code>		
<code>\ErrorIndicator</code>		
<code>\UnknownGlyph</code>		
<code>\SelectionPlaceholder</code>		
<code>\Placeholder</code>		
<code>\SixPointedStar</code>		
<code>\Rectangle</code>		
<code>\GrayRectangle</code>		
<code>\EmptyRectangle</code>		
<code>\Square</code>		
<code>\GraySquare</code>		
<code>\EmptySquare</code>		
<code>\Circle</code>		
<code>\GrayCircle</code>		
<code>\EmptyCircle</code>		
<code>\Ellipsis</code>		
<code>\CenterEllipsis</code>		
<code>\VerticalEllipsis</code>		
<code>\AscendingEllipsis</code>		
<code>\DescendingEllipsis</code>		

Table 19: *Mathematica* specials. The symbols here are intended for typesetting notebooks.

Double brackets			
<code>\lpart</code>	\llcorner	\llcorner	\llcorner
<code>\rpart</code>	\lrcorner	\lrcorner	\lrcorner
<code>\llbracket</code>	\llbracket	\llbracket	\llbracket
<code>\rrbracket</code>	\rrbracket	\rrbracket	\rrbracket

<code>\SetDelayed</code>	$a := b$	$a := b$	binary operator
<code>\UPSET</code>	$a \hat{=} b$	$a \hat{=} b$	binary operator
<code>\UPSETD</code>	$a \hat{:=} b$	$a \hat{:=} b$	binary operator
<code>\TAG</code>	$a /: b$	$a /: b$	binary operator
<code>\Rule</code>	$a \rightarrow b$	$a \rightarrow b$	binary operator
<code>\RuleDelayed</code>	$a \rightarrow b$	$a \rightarrow b$	binary operator
<code>\Equal</code>	$a == b$	$a == b$	binary operator
<code>\Slot</code>	$\#$	$\#$	ordinary symbol
<code>\PEQ</code>	$a += b$	$a += b$	binary operator
<code>\MEQ</code>	$a -= b$	$a -= b$	binary operator
<code>\TEQ</code>	$a *= b$	$a *= b$	binary operator
<code>\DEQ</code>	$a /= b$	$a /= b$	binary operator
<code>\PP</code>	$++$	$++$	ordinary symbol
<code>\MM</code>	$--$	$--$	ordinary symbol
<code>\SCAT</code>	$a \langle \rangle b$	$a \langle \rangle b$	binary operator
<code>\MAP</code>	$a /@ b$	$a /@ b$	binary operator
<code>\MAPALL</code>	$a //@ b$	$a //@ b$	binary operator
<code>\COND</code>	$a /; b$	$a /; b$	binary operator
<code>\PSTFIX</code>	$a // b$	$a // b$	binary operator
<code>\RPLC</code>	$a /. b$	$a /. b$	binary operator
<code>\RPLCRP</code>	$a //. b$	$a //. b$	binary operator