The amssymb package

American Mathematical Society

Version 3.01, 2013/01/14

1 Introduction

This file defines all the symbols found in the AMS symbol fonts msam and msbm.

2 The Implementation

First provide package identification.

```
\NeedsTeXFormat{LaTeX2e}% LaTeX 2.09 can't be used (nor non-LaTeX)
[1994/12/01]% LaTeX date must be December 1994 or later
\ProvidesPackage{amssymb}[2013/01/14 v3.01 AMS font symbols]
```

See the amsfonts package documentation for a discussion of the obsolescence of the psamfonts option.

```
\DeclareOption{psamsfonts}{\PassOptionsToPackage{psamsfonts}{amsfonts}}
```

Process options.

```
\ProcessOptions\relax
```

We call the amsfonts package to do the font setup that we need.

```
\RequirePackage{amsfonts}[1995/01/01]
```

```
\@ifpackageloaded{stix}{%
    \PackageWarningNoLine{amssymb}{The 'amssymb' package is redundant when
      you are using the 'stix' package, so I'm not going to load amssymb}
    \endinput
}{}
```

We undefine a few symbols that were perhaps defined by the amsfonts package (q.v.); otherwise \DeclareMathSymbol would issue some error messages. (All these symbol names are \let to the first defined; that way, if the underlying code changes, only one change needs to be made here.)

```
\let\square\relax \let\rightsquigarrow\square \let\lozenge\square
\let\vartriangleright\square \let\vartriangleleft\square
\let\trianglerighteq\square \let\trianglelefteq\square
```

Change the \catcode of the double-quote character to ensure that it is not active (which at one time was a problem when something like german.sty was used). This means that \let statements must be made global.

```
\begingroup \catcode`\"=12
```

Now we define the complete set of standard symbol names for the msam and msbm fonts. Redefinitions of symbols or commands which can't be defined via \DeclareMathSymbol are already done in the amsfonts package (for example, \yen, \widehat).

```
\DeclareMathSymbol{\boxdot}       {\mathbin}{AMSa}{"00}
\DeclareMathSymbol{\boxplus}      {\mathbin}{AMSa}{"01}
\DeclareMathSymbol{\boxtimes}     {\mathbin}{AMSa}{"02}
\DeclareMathSymbol{\square}       {\mathord}{AMSa}{"03}
\DeclareMathSymbol{\blacksquare}  {\mathord}{AMSa}{"04}
```

```
\DeclareMathSymbol{\centerdot}    {\mathbin}{AMSa}{"05}
\DeclareMathSymbol{\lozenge}      {\mathord}{AMSa}{"06}
\DeclareMathSymbol{\blacklozenge} {\mathord}{AMSa}{"07}
\DeclareMathSymbol{\circlearrowright}   {\mathrel}{AMSa}{"08}
\DeclareMathSymbol{\circlearrowleft}    {\mathrel}{AMSa}{"09}
%% In amsfonts.sty:
%%\DeclareMathSymbol{\rightleftharpoons}{\mathrel}{AMSa}{"0A}
\DeclareMathSymbol{\leftrightharpoons}  {\mathrel}{AMSa}{"0B}
\DeclareMathSymbol{\boxminus}     {\mathbin}{AMSa}{"0C}
\DeclareMathSymbol{\Vdash}        {\mathrel}{AMSa}{"0D}
\DeclareMathSymbol{\Vvdash}       {\mathrel}{AMSa}{"0E}
\DeclareMathSymbol{\vDash}        {\mathrel}{AMSa}{"0F}
\DeclareMathSymbol{\twoheadrightarrow}  {\mathrel}{AMSa}{"10}
\DeclareMathSymbol{\twoheadleftarrow}   {\mathrel}{AMSa}{"11}
\DeclareMathSymbol{\leftleftarrows}     {\mathrel}{AMSa}{"12}
\DeclareMathSymbol{\rightrightarrows}   {\mathrel}{AMSa}{"13}
\DeclareMathSymbol{\upuparrows}         {\mathrel}{AMSa}{"14}
\DeclareMathSymbol{\downdownarrows} {\mathrel}{AMSa}{"15}
\DeclareMathSymbol{\upharpoonright} {\mathrel}{AMSa}{"16}
 \global\let\restriction\upharpoonright
\DeclareMathSymbol{\downharpoonright}   {\mathrel}{AMSa}{"17}
\DeclareMathSymbol{\upharpoonleft}  {\mathrel}{AMSa}{"18}
\DeclareMathSymbol{\downharpoonleft}{\mathrel}{AMSa}{"19}
\DeclareMathSymbol{\rightarrowtail} {\mathrel}{AMSa}{"1A}
\DeclareMathSymbol{\leftarrowtail}  {\mathrel}{AMSa}{"1B}
\DeclareMathSymbol{\leftrightarrows}{\mathrel}{AMSa}{"1C}
\DeclareMathSymbol{\rightleftarrows}{\mathrel}{AMSa}{"1D}
\DeclareMathSymbol{\Lsh}            {\mathrel}{AMSa}{"1E}
\DeclareMathSymbol{\Rsh}            {\mathrel}{AMSa}{"1F}
\DeclareMathSymbol{\rightsquigarrow}  {\mathrel}{AMSa}{"20}
\DeclareMathSymbol{\leftrightsquigarrow}{\mathrel}{AMSa}{"21}
\DeclareMathSymbol{\looparrowleft}  {\mathrel}{AMSa}{"22}
\DeclareMathSymbol{\looparrowright} {\mathrel}{AMSa}{"23}
\DeclareMathSymbol{\circeq}       {\mathrel}{AMSa}{"24}
\DeclareMathSymbol{\succsim}      {\mathrel}{AMSa}{"25}
\DeclareMathSymbol{\gtrsim}       {\mathrel}{AMSa}{"26}
\DeclareMathSymbol{\gtrapprox}    {\mathrel}{AMSa}{"27}
\DeclareMathSymbol{\multimap}     {\mathrel}{AMSa}{"28}
\DeclareMathSymbol{\therefore}    {\mathrel}{AMSa}{"29}
\DeclareMathSymbol{\because}      {\mathrel}{AMSa}{"2A}
\DeclareMathSymbol{\doteqdot}     {\mathrel}{AMSa}{"2B}
 \global\let\Doteq\doteqdot
\DeclareMathSymbol{\triangleq}    {\mathrel}{AMSa}{"2C}
\DeclareMathSymbol{\precsim}      {\mathrel}{AMSa}{"2D}
\DeclareMathSymbol{\lesssim}      {\mathrel}{AMSa}{"2E}
\DeclareMathSymbol{\lessapprox}   {\mathrel}{AMSa}{"2F}
\DeclareMathSymbol{\eqslantless}  {\mathrel}{AMSa}{"30}
\DeclareMathSymbol{\eqslantgtr}   {\mathrel}{AMSa}{"31}
\DeclareMathSymbol{\curlyeqprec}  {\mathrel}{AMSa}{"32}
\DeclareMathSymbol{\curlyeqsucc}  {\mathrel}{AMSa}{"33}
\DeclareMathSymbol{\preccurlyeq}  {\mathrel}{AMSa}{"34}
\DeclareMathSymbol{\leqq}         {\mathrel}{AMSa}{"35}
\DeclareMathSymbol{\leqslant}     {\mathrel}{AMSa}{"36}
\DeclareMathSymbol{\lessgtr}      {\mathrel}{AMSa}{"37}
\DeclareMathSymbol{\backprime}    {\mathord}{AMSa}{"38}
\DeclareMathSymbol{\risingdotseq} {\mathrel}{AMSa}{"3A}
\DeclareMathSymbol{\fallingdotseq}{\mathrel}{AMSa}{"3B}
\DeclareMathSymbol{\succcurlyeq}  {\mathrel}{AMSa}{"3C}
\DeclareMathSymbol{\geqq}         {\mathrel}{AMSa}{"3D}
```

```
\DeclareMathSymbol{\geqslant}     {\mathrel}{AMSa}{"3E}
\DeclareMathSymbol{\gtrless}      {\mathrel}{AMSa}{"3F}
%% in amsfonts.sty
%% \DeclareMathSymbol{\sqsubset}    {\mathrel}{AMSa}{"40}
%% \DeclareMathSymbol{\sqsupset}    {\mathrel}{AMSa}{"41}
\DeclareMathSymbol{\vartriangleright}{\mathrel}{AMSa}{"42}
\DeclareMathSymbol{\vartriangleleft} {\mathrel}{AMSa}{"43}
\DeclareMathSymbol{\trianglerighteq} {\mathrel}{AMSa}{"44}
\DeclareMathSymbol{\trianglelefteq}  {\mathrel}{AMSa}{"45}
\DeclareMathSymbol{\bigstar}    {\mathord}{AMSa}{"46}
\DeclareMathSymbol{\between}    {\mathrel}{AMSa}{"47}
\DeclareMathSymbol{\blacktriangledown}  {\mathord}{AMSa}{"48}
\DeclareMathSymbol{\blacktriangleright} {\mathrel}{AMSa}{"49}
\DeclareMathSymbol{\blacktriangleleft}  {\mathrel}{AMSa}{"4A}
\DeclareMathSymbol{\vartriangle}        {\mathrel}{AMSa}{"4D}
\DeclareMathSymbol{\blacktriangle}      {\mathord}{AMSa}{"4E}
\DeclareMathSymbol{\triangledown}       {\mathord}{AMSa}{"4F}
\DeclareMathSymbol{\eqcirc}       {\mathrel}{AMSa}{"50}
\DeclareMathSymbol{\lesseqgtr}    {\mathrel}{AMSa}{"51}
\DeclareMathSymbol{\gtreqless}    {\mathrel}{AMSa}{"52}
\DeclareMathSymbol{\lesseqqgtr}   {\mathrel}{AMSa}{"53}
\DeclareMathSymbol{\gtreqqless}   {\mathrel}{AMSa}{"54}
\DeclareMathSymbol{\Rrightarrow}  {\mathrel}{AMSa}{"56}
\DeclareMathSymbol{\Lleftarrow}   {\mathrel}{AMSa}{"57}
\DeclareMathSymbol{\veebar}       {\mathbin}{AMSa}{"59}
\DeclareMathSymbol{\barwedge}     {\mathbin}{AMSa}{"5A}
\DeclareMathSymbol{\doublebarwedge} {\mathbin}{AMSa}{"5B}
%% In amsfonts.sty
%%\DeclareMathSymbol{\angle}        {\mathord}{AMSa}{"5C}
\DeclareMathSymbol{\measuredangle}  {\mathord}{AMSa}{"5D}
\DeclareMathSymbol{\sphericalangle} {\mathord}{AMSa}{"5E}
\DeclareMathSymbol{\varpropto}    {\mathrel}{AMSa}{"5F}
\DeclareMathSymbol{\smallsmile}   {\mathrel}{AMSa}{"60}
\DeclareMathSymbol{\smallfrown}   {\mathrel}{AMSa}{"61}
\DeclareMathSymbol{\Subset}       {\mathrel}{AMSa}{"62}
\DeclareMathSymbol{\Supset}       {\mathrel}{AMSa}{"63}
\DeclareMathSymbol{\Cup}          {\mathbin}{AMSa}{"64}
 \global\let\doublecup\Cup
\DeclareMathSymbol{\Cap}          {\mathbin}{AMSa}{"65}
 \global\let\doublecap\Cap
\DeclareMathSymbol{\curlywedge}   {\mathbin}{AMSa}{"66}
\DeclareMathSymbol{\curlyvee}     {\mathbin}{AMSa}{"67}
\DeclareMathSymbol{\leftthreetimes} {\mathbin}{AMSa}{"68}
\DeclareMathSymbol{\rightthreetimes}{\mathbin}{AMSa}{"69}
\DeclareMathSymbol{\subseteqq}    {\mathrel}{AMSa}{"6A}
\DeclareMathSymbol{\supseteqq}    {\mathrel}{AMSa}{"6B}
\DeclareMathSymbol{\bumpeq}       {\mathrel}{AMSa}{"6C}
\DeclareMathSymbol{\Bumpeq}       {\mathrel}{AMSa}{"6D}
\DeclareMathSymbol{\lll}          {\mathrel}{AMSa}{"6E}
 \global\let\llless\lll
\DeclareMathSymbol{\ggg}          {\mathrel}{AMSa}{"6F}
 \global\let\gggtr\ggg
\DeclareMathSymbol{\circledS}     {\mathord}{AMSa}{"73}
\DeclareMathSymbol{\pitchfork}    {\mathrel}{AMSa}{"74}
\DeclareMathSymbol{\dotplus}      {\mathbin}{AMSa}{"75}
\DeclareMathSymbol{\backsim}      {\mathrel}{AMSa}{"76}
\DeclareMathSymbol{\backsimeq}    {\mathrel}{AMSa}{"77}
\DeclareMathSymbol{\complement}   {\mathord}{AMSa}{"7B}
\DeclareMathSymbol{\intercal}     {\mathbin}{AMSa}{"7C}
```

```
\DeclareMathSymbol{\circledcirc}  {\mathbin}{AMSa}{"7D}
\DeclareMathSymbol{\circledast}   {\mathbin}{AMSa}{"7E}
\DeclareMathSymbol{\circleddash}  {\mathbin}{AMSa}{"7F}
%%   Begin AMSb declarations
\DeclareMathSymbol{\lvertneqq}    {\mathrel}{AMSb}{"00}
\DeclareMathSymbol{\gvertneqq}    {\mathrel}{AMSb}{"01}
\DeclareMathSymbol{\nleq}         {\mathrel}{AMSb}{"02}
\DeclareMathSymbol{\ngeq}         {\mathrel}{AMSb}{"03}
\DeclareMathSymbol{\nless}        {\mathrel}{AMSb}{"04}
\DeclareMathSymbol{\ngtr}         {\mathrel}{AMSb}{"05}
\DeclareMathSymbol{\nprec}        {\mathrel}{AMSb}{"06}
\DeclareMathSymbol{\nsucc}        {\mathrel}{AMSb}{"07}
\DeclareMathSymbol{\lneqq}        {\mathrel}{AMSb}{"08}
\DeclareMathSymbol{\gneqq}        {\mathrel}{AMSb}{"09}
\DeclareMathSymbol{\nleqslant}    {\mathrel}{AMSb}{"0A}
\DeclareMathSymbol{\ngeqslant}    {\mathrel}{AMSb}{"0B}
\DeclareMathSymbol{\lneq}         {\mathrel}{AMSb}{"0C}
\DeclareMathSymbol{\gneq}         {\mathrel}{AMSb}{"0D}
\DeclareMathSymbol{\npreceq}      {\mathrel}{AMSb}{"0E}
\DeclareMathSymbol{\nsucceq}      {\mathrel}{AMSb}{"0F}
\DeclareMathSymbol{\precnsim}     {\mathrel}{AMSb}{"10}
\DeclareMathSymbol{\succnsim}     {\mathrel}{AMSb}{"11}
\DeclareMathSymbol{\lnsim}        {\mathrel}{AMSb}{"12}
\DeclareMathSymbol{\gnsim}        {\mathrel}{AMSb}{"13}
\DeclareMathSymbol{\nleqq}        {\mathrel}{AMSb}{"14}
\DeclareMathSymbol{\ngeqq}        {\mathrel}{AMSb}{"15}
\DeclareMathSymbol{\precneqq}     {\mathrel}{AMSb}{"16}
\DeclareMathSymbol{\succneqq}     {\mathrel}{AMSb}{"17}
\DeclareMathSymbol{\precnapprox}  {\mathrel}{AMSb}{"18}
\DeclareMathSymbol{\succnapprox}  {\mathrel}{AMSb}{"19}
\DeclareMathSymbol{\lnapprox}     {\mathrel}{AMSb}{"1A}
\DeclareMathSymbol{\gnapprox}     {\mathrel}{AMSb}{"1B}
\DeclareMathSymbol{\nsim}         {\mathrel}{AMSb}{"1C}
\DeclareMathSymbol{\ncong}        {\mathrel}{AMSb}{"1D}
\DeclareMathSymbol{\diagup}       {\mathord}{AMSb}{"1E}
\DeclareMathSymbol{\diagdown}     {\mathord}{AMSb}{"1F}
\DeclareMathSymbol{\varsubsetneq}   {\mathrel}{AMSb}{"20}
\DeclareMathSymbol{\varsupsetneq}   {\mathrel}{AMSb}{"21}
\DeclareMathSymbol{\nsubseteqq}     {\mathrel}{AMSb}{"22}
\DeclareMathSymbol{\nsupseteqq}     {\mathrel}{AMSb}{"23}
\DeclareMathSymbol{\subsetneqq}     {\mathrel}{AMSb}{"24}
\DeclareMathSymbol{\supsetneqq}     {\mathrel}{AMSb}{"25}
\DeclareMathSymbol{\varsubsetneqq}  {\mathrel}{AMSb}{"26}
\DeclareMathSymbol{\varsupsetneqq}  {\mathrel}{AMSb}{"27}
\DeclareMathSymbol{\subsetneq}      {\mathrel}{AMSb}{"28}
\DeclareMathSymbol{\supsetneq}      {\mathrel}{AMSb}{"29}
\DeclareMathSymbol{\nsubseteq}      {\mathrel}{AMSb}{"2A}
\DeclareMathSymbol{\nsupseteq}      {\mathrel}{AMSb}{"2B}
\DeclareMathSymbol{\nparallel}      {\mathrel}{AMSb}{"2C}
\DeclareMathSymbol{\nmid}           {\mathrel}{AMSb}{"2D}
\DeclareMathSymbol{\nshortmid}      {\mathrel}{AMSb}{"2E}
\DeclareMathSymbol{\nshortparallel} {\mathrel}{AMSb}{"2F}
\DeclareMathSymbol{\nvdash}         {\mathrel}{AMSb}{"30}
\DeclareMathSymbol{\nVdash}         {\mathrel}{AMSb}{"31}
\DeclareMathSymbol{\nvDash}         {\mathrel}{AMSb}{"32}
\DeclareMathSymbol{\nVDash}         {\mathrel}{AMSb}{"33}
\DeclareMathSymbol{\ntrianglerighteq}{\mathrel}{AMSb}{"34}
\DeclareMathSymbol{\ntrianglelefteq}{\mathrel}{AMSb}{"35}
\DeclareMathSymbol{\ntriangleleft}  {\mathrel}{AMSb}{"36}
```

```
198 \DeclareMathSymbol{\ntriangleright} {\mathrel}{AMSb}{"37}
199 \DeclareMathSymbol{\nleftarrow}     {\mathrel}{AMSb}{"38}
200 \DeclareMathSymbol{\nrightarrow}    {\mathrel}{AMSb}{"39}
201 \DeclareMathSymbol{\nLeftarrow}     {\mathrel}{AMSb}{"3A}
202 \DeclareMathSymbol{\nRightarrow}    {\mathrel}{AMSb}{"3B}
203 \DeclareMathSymbol{\nLeftrightarrow}{\mathrel}{AMSb}{"3C}
204 \DeclareMathSymbol{\nleftrightarrow}{\mathrel}{AMSb}{"3D}
205 \DeclareMathSymbol{\divideontimes}  {\mathbin}{AMSb}{"3E}
206 \DeclareMathSymbol{\varnothing}     {\mathord}{AMSb}{"3F}
207 \DeclareMathSymbol{\nexists}        {\mathord}{AMSb}{"40}
208 \DeclareMathSymbol{\Finv}           {\mathord}{AMSb}{"60}
209 \DeclareMathSymbol{\Game}           {\mathord}{AMSb}{"61}
210 %% In amsfonts.sty:
211 %%\DeclareMathSymbol{\mho}          {\mathord}{AMSb}{"66}
212 \DeclareMathSymbol{\eth}            {\mathord}{AMSb}{"67}
213 \DeclareMathSymbol{\eqsim}          {\mathrel}{AMSb}{"68}
214 \DeclareMathSymbol{\beth}           {\mathord}{AMSb}{"69}
215 \DeclareMathSymbol{\gimel}          {\mathord}{AMSb}{"6A}
216 \DeclareMathSymbol{\daleth}         {\mathord}{AMSb}{"6B}
217 \DeclareMathSymbol{\lessdot}        {\mathbin}{AMSb}{"6C}
218 \DeclareMathSymbol{\gtrdot}         {\mathbin}{AMSb}{"6D}
219 \DeclareMathSymbol{\ltimes}         {\mathbin}{AMSb}{"6E}
220 \DeclareMathSymbol{\rtimes}         {\mathbin}{AMSb}{"6F}
221 \DeclareMathSymbol{\shortmid}       {\mathrel}{AMSb}{"70}
222 \DeclareMathSymbol{\shortparallel}  {\mathrel}{AMSb}{"71}
223 \DeclareMathSymbol{\smallsetminus}  {\mathbin}{AMSb}{"72}
224 \DeclareMathSymbol{\thicksim}       {\mathrel}{AMSb}{"73}
225 \DeclareMathSymbol{\thickapprox}    {\mathrel}{AMSb}{"74}
226 \DeclareMathSymbol{\approxeq}       {\mathrel}{AMSb}{"75}
227 \DeclareMathSymbol{\succapprox}     {\mathrel}{AMSb}{"76}
228 \DeclareMathSymbol{\precapprox}     {\mathrel}{AMSb}{"77}
229 \DeclareMathSymbol{\curvearrowleft} {\mathrel}{AMSb}{"78}
230 \DeclareMathSymbol{\curvearrowright}{\mathrel}{AMSb}{"79}
231 \DeclareMathSymbol{\digamma}        {\mathord}{AMSb}{"7A}
232 \DeclareMathSymbol{\varkappa}       {\mathord}{AMSb}{"7B}
233 \DeclareMathSymbol{\Bbbk}           {\mathord}{AMSb}{"7C}
234 \DeclareMathSymbol{\hslash}         {\mathord}{AMSb}{"7D}
235 %% In amsfonts.sty:
236 %%\DeclareMathSymbol{\hbar}         {\mathord}{AMSb}{"7E}
237 \DeclareMathSymbol{\backepsilon}    {\mathrel}{AMSb}{"7F}
```

Now we close the group so that `"` will get its old `\catcode` back.

```
238 \endgroup
```

The usual `\endinput` to ensure that random garbage at the end of the file doesn't get copied by `docstrip`.

```
239 \endinput
```

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Numbers written in italic refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in roman refer to the code lines where the entry is used.

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