

# User's Guide to $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$ Version 2.0

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## 1. OVERVIEW

$\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  is a macro package for  $\mathcal{T}\mathcal{E}\mathcal{X}$ , designed to simplify the input of mathematical material and format the output according to preset style specifications. Although  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  is copyright by the American Mathematical Society, its use is not restricted, but is encouraged for the preparation of manuscripts intended for publication both in the Society's books and journals, and also in other mathematical literature. In recognition of the copyright, the Society requests that published documents prepared with  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  include an acknowledgment of its use. The suggested forms for acknowledgments are given in the section **Other Things You Ought to Know**.

Version 2.0 of  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  contains numerous minor improvements and bug fixes, as well as some major changes involving additional fonts. This User's Guide describes all the new and changed features and how to use them. Topics are grouped by type, and then presented in roughly the same order as they appear in *The Joy of  $\mathcal{T}\mathcal{E}\mathcal{X}$* .

This User's Guide assumes that you already have a copy of *The Joy of  $\mathcal{T}\mathcal{E}\mathcal{X}$* . It contains references to specific pages that probably won't make sense if you don't have a copy. It also assumes that you will be using the "preprint style," a set of macros that provides features specific to the formatting of a document, such as headings, page numbers, and the like. If you are planning to use the preprint style, you will also need to have a copy of  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts Version 2.0. *The Joy of  $\mathcal{T}\mathcal{E}\mathcal{X}$*  and  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts 2.0 are available from the American Mathematical Society and other distributors.

Typeset by  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$

**Files comprising the  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  Version 2.0 package**

The following files are contained in the  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  Version 2.0 package distributed by AMS:

<code>AMSTEX.TEX</code>	the $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$ Version 2.0 macros
<code>AMSSYM.TEX</code>	macros defining the symbols in fonts <code>msam</code> and <code>msbm</code>
<code>AMSPPT.STY</code>	the preprint style for $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$ Version 2.0
<code>AMSPPT.DOC</code>	technical documentation for <code>AMSPPT.STY</code>
<code>AMSGUIDE.TEX</code>	the source file for this User's Guide
<code>JOYERR.TEX</code>	errata to <i>The Joy of <math>\mathcal{T}\mathcal{E}\mathcal{X}</math></i> prior to $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$ Version 2.0

The file `AMSPPT.DOC` is an ASCII file, and is not intended to be processed with  $\mathcal{T}\mathcal{E}\mathcal{X}$ . This documentation file is arranged in the same order as the macro file that it describes, and explains the intent and mechanics of the macros in detail. A separate file (`AMSTEX.DOC`), documenting the file `AMSTEX.TEX`, is available on request.

For instructions on installing the  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  macros and preprint style, see the separate Installation Guide provided with the package.

**General description of changes**

$\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  2.0, the preprint style, and their technical documentation are the result of a joint effort begun by Michael Spivak and extended by the Composition Technical Support group of the American Mathematical Society.

In this new version of  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$ , the following changes have been installed:

- (1) All known bugs have been eliminated.
- (2) Messages identifying the current versions of `AMSTEX.TEX` and `AMSPPT.STY` will be displayed on your terminal screen and in the log file.
- (3) Some error and help messages have been changed for the sake of clarity or to provide more information.
- (4) Refinements have been made to conserve memory space.
- (5) The CM versions of the Computer Modern fonts have replaced the AM versions.
- (6) Support for additional fonts has been added.
  - (a) `AMSTEX.TEX` provides the mechanism for accessing the Euler and extra symbol fonts of the AMSFonts collection.
  - (b) The preprint style assumes that fonts `msam`, `msbm`, and `eufm` are installed and available.
- (7) Changes have been made to the preprint style to make it conform more closely to the style of AMS publications, in particular, the *Journal of the American Mathematical Society*.
  - (a) Running heads are automatic; they can be suppressed if desired.
  - (b) Additional elements are recognized in both the top matter and the body of a document, and the input syntax has been regularized.
  - (c) Footnotes are now indented.<sup>1</sup>
  - (d) The style of the references has changed considerably.
- (8) In the preprint style, mathematics-oriented hyphenation exceptions have been added. (These follow American, not British, rules.)

---

<sup>1</sup>Like this.

- (9) A new option in the preprint style allows documents to be formatted as chapters of a monograph rather than as separate papers.
- (10) Finally, some optional formatting features requested by  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  users have been added to the preprint style.

### This User's Guide

This User's Guide has been prepared using  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  Version 2.0 with the preprint style. Some changes have been made: font and dimension settings have been reset, the macros for headings have been redefined to produce a result more suited to documentation, and some *ad hoc* macros have been defined to simplify the presentation of particular information. However, in general, this document and the file from which it was produced illustrate the general appearance and input for a preprint with running heads. Printing the output of  $\mathcal{T}\mathcal{E}\mathcal{X}$  for this Guide requires  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts Version 2.0.

## 2. FORMATTING FEATURES

Formatting documents prepared with  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  is accomplished by a "style file." The features described here are part of the preprint style. The preprint style for  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  Version 2.0 will, unless it is told to use the style of a `\Monograph`, format an input file in a manner suitable for a paper in a journal. Unless noted otherwise, that is the style described below.

### Top matter (*Joy*, p. 40)

Some commands affect the appearance of a whole document. Such commands should go at the top of your input file, right after the `\documentstyle` line and before the `\topmatter` line. This area will be referred to as the "preamble." Commands that should be in the preamble include the existing tags `\define`, `\TagsOnRight`, etc., and the new options `\NoPageNumbers`, `\NoRunningHeads`, `\Monograph`, `\pagewidth`, `\pageheight`, `\pageno`, and commands that load fonts. The preamble is relevant to any document, whether paper or monograph.

The syntax of elements of the top matter has been changed. All now require both a beginning and an ending tag. The beginning of an  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  file should thus look something like this:

```

\input amstex
\documentstyle{...}

{preamble commands, such as \define, \pageno,
\NoRunningHeads, \Monograph, \loadbold, etc.}

\topmatter

```

```

\title...\endtitle
\author...\endauthor
\affil...\endaffil
\address...\endaddress
\email...\endemail
\dedicatory...\enddedicatory
\date...\enddate
\thanks...\endthanks
\translator...\endtranslator
\keywords...\endkeywords
\subclass...\endsubclass
\abstract...\endabstract
\endtopmatter
\document

```

If any `\end...` tag is omitted, an error message will appear at `\endtopmatter`, if not before. If the forgotten tag was `\endtitle`, `\endkeywords`, or another `\end...` for an item that has the `\nofrills` option, the error message will be “! Paragraph ended before `\next@` was complete.” If you omit `\endtopmatter`, on the other hand, none of the topmatter material will print (as before).

For multi-line titles, affiliations, authors, or dedications (basically everywhere that lines are centered individually rather than being set in paragraphs), line breaks are obtained by using `\\`. In other parts of the topmatter, which are set in paragraph form, line breaks are obtained by `\linebreak`.

The title will be set in uppercase. To turn off the automatic uppercasing, use the `\nofrills` option: `\title\nofrills...\endtitle`.

The `\overlong` option that used to be available for `\title`, `\author`, and `\head` has been removed, mainly because publishers as a rule would rather introduce extra line breaks than allow text to hang over into the margins.

Electronic mail addresses can be typed using `\email...\endemail`. Every `\email` address must be preceded by a regular `\address`. Multiple `\email` addresses may be used, but each `\email...\endemail` must be paired with the `\address` of the same author. The `\email` address will be printed at the end of the paper, as “*E-mail*: `<net-address>`”, following the address it is paired with. If no preceding `\address` exists, the e-mail address will not print.

The `\dedicatory` is new, to be used for such things as “Dedicated to Professor X on the occasion of his eightieth birthday.” A dedication will appear in italics, before the abstract.

Unlike `\address` and `\email`, `\thanks` cannot appear more than once in the topmatter. It is sometimes desirable, however, to acknowledge support separately for separate authors of a joint paper. Since `\thanks` creates an unnumbered footnote, separate acknowledgments should be made separate paragraphs within the footnote. But this brings up a special problem: It’s fairly easy to forget the ending `}` for a `\footnote`, so an error-detecting mechanism built into  $\mathcal{T}\mathcal{E}\mathcal{X}$  looks for the end of a paragraph within a footnote, and if it sees one, assumes that you’ve forgotten the `}` and issues an error message. In order to end a paragraph without setting off

the error-detector, you must use `\endgraf`<sup>2</sup> instead of a blank line or `\par`.

In case a paper has not only an author but a translator, `\translator` is provided. This information will be printed at the end of the paper in eight-point roman, as “Translated by” followed by the translator’s name in uppercase.

The information for `\keywords` and `\subjclass` now appear as unnumbered footnotes at the foot of the first page, as in AMS journals. (They used to appear at the end of an article.) In a monograph chapter they will not print at all, since they should be handled separately, as part of the front matter for the monograph.

The abstract heading, “`ABSTRACT.`”, now appears in caps and small caps, in the same size (eight point) as the abstract itself.

A simple table of contents setup is now available. Tables of contents are typed in the topmatter along with everything else (except for monographs—see the section **Book Formatting** below), using `\toc... \endtoc`.

```
\toc
\specialhead... \endspecialhead
\head... \endhead
\subhead... \endsubhead
\subsubhead... \endsubsubhead
\endtoc
```

The syntax of the parts is intentionally identical to the syntax used for headings within the document (see the sections **Headings** and **Book Formatting** below), so that for those who wish to do so and have a capable text editor, the table of contents can be constructed by extracting the relevant lines from the main text.<sup>3</sup>

Page numbers aren’t usually appropriate for the short table of contents that might appear in a journal article, but if desired, page numbers can be entered in a manner similar to that for a monograph; see the section **Book Formatting** below.

The hanging indentation within a table of contents for `\head` and `\subhead` is preset to accommodate numbers of the form “1.” and “1.1.” respectively; the amount of indentation can be adjusted by using `\widestnumber`:

```
\toc
\widestnumber\head{10}
\widestnumber\subhead{10.1}
...
```

This can be done more than once within different sections of the table of contents, if desired.

If the “section number” of a `\head` happens to be something like “Appendix” (as actually happens in this User’s Guide), the input should be modified as follows:

```
\head {} Appendix. Sample bibliography input ... \endhead
```

Insertion of `{}` followed by a space at the beginning of the heading text will cause the entire entry to be set flush left as a unit.

If you are preparing a monograph, the format and content of the top matter will be different. See the section below on **Book Formatting** for details.

<sup>2</sup>`\endgraf` is just an abbreviation for “end paragraph.”

<sup>3</sup>But note that the original line breaks in multi-line headings would not be appropriate for the table of contents, so you’d want to remove any `\`’s that might be present.

**Headings** (*Joy*, p. 42)

There are now four levels of headings instead of two (not counting `\title's`), and the names have been changed to have consistent syntax. The old form was `\heading... \endheading` and `\subheading{...}`. The new headings are:

```
\specialhead... \endspecialhead
\head... \endhead
\subhead... \endsubhead
\subsubhead... \endsubsubhead
```

The heading of this section was typed as

```
\head 2. Formatting Features
\endhead
```

And the subheading for this subsection was typed as

```
\subhead Headings {\rm ({\it Joy}, p.~42)}
\endsubhead
```

Ordinarily, subheadings in the preprint style are run into the text, but for this User's Guide, the style varies slightly.

`\specialhead` is for long articles that need extra divisions at a level above the `\head` level. In the preprint style `\specialhead` uses boldface type and is set ragged right; `\head` is small caps, centered; `\subhead` is boldface, flush left, run in with the following text; and `\subsubhead` is italic, indented as for an ordinary paragraph, and run into the text.

Explicit line breaks are obtained by a `\\` in a `\head` or a `\specialhead`, but for `\subhead` and `\subsubhead`, which are part of their paragraph, just use `\linebreak` as you would in normal paragraphed text.

If you are preparing a monograph, the styles of headings will be different. See the section below on **Book Formatting** for details.

**Theorems and Proofs** (*Joy*, pp. 42–43)

In accordance with the style of the *Journal of the American Mathematical Society*, the labels on `\proclaim's` and similar constructions are now printed in boldface type (`\bf`). However, unlike the *Journal of the American Mathematical Society*, the preprint style uses slanted type (`\sl`) for the text of a `\proclaim`, rather than italic. (Most American Mathematical Society publications currently use Times Roman fonts, for which no slanted form was designed.)

In addition to the usual proclamations and demonstrations, mathematicians may pose other kinds of propositions, which editors may prefer to see presented in different styles. The following have been provided in the preprint style.

```
\definition... \enddefinition
\example... \endexample
\remark... \endremark
```

In the preprint style `\definition` and `\example` have the spacing and heading font of `\proclaim`, but are in roman. `\remark` resembles `\demo` except that extra space added at the end of a proof by `\enddemo` is not added by `\endremark`.

**Other Devices** (*Joy*, pp. 43–45)

For a list produced by `\roster`, the amount of indentation can be adjusted to accommodate wide item numbers. Just before beginning the `\roster`, type, for example, `\widestnumber\item{(viii)}`. This adjustment is temporary. The default will be reinstated by `\endroster`.

Formerly `\cite` produced the reference citation in boldface type, within square brackets: `[21]`; the current AMS style retains the brackets but uses roman type instead of boldface: `[21]`.

A new structure, `\block...\endblock`, has been added for quotations. It is intended for use in the middle of a paragraph to quote an extract from another source.

**Book Formatting** (new entry, *Joy*, p. 143)

If you are preparing a monograph, several features are available in the preprint style that will make your output look like chapters rather than individual papers.

First of all, you must signal your intentions by typing `\Monograph` in the preamble, right after the `\documentstyle` line.

A typical topmatter section for a monograph chapter would be typed like this:

```
\documentstyle{amspt}
\Monograph
\topmatter
\title\chapter{4} Matrix Algebras\endtitle
\endtopmatter
```

which produces a chapter heading that looks like this:

CHAPTER IV

**MATRIX ALGEBRAS**

Notice that the number is converted automatically to roman numerals and the word “CHAPTER” is added. For a chapter title that needs a different sort of treatment, `\nofrills` can be used:

```
\topmatter
\title\chapter\nofrills{APPENDIX B} The Poisson Integral\endtitle
\endtopmatter
```

This produces

APPENDIX B

**THE POISSON INTEGRAL**

The replacement `\chapter` text will appear exactly as typed.

Finally, for things like a preface or introduction which has no pretitle text at all, omit the `\chapter` command:

```
\topmatter
\title Preface\endtitle
\endtopmatter
```

In monographs, the table of contents is usually treated as a separate chapter. Start by typing the title “Contents” as for a preface or introduction, and then use the `\toc...\endtoc` structure as the body of the document (rather than putting it in the `topmatter`, as you would for a journal article).

```
\topmatter
\title Contents\endtitle
\endtopmatter

\document
\toc
\title Preface\page{vii}\endtitle
\title\chapter{1} Matrix Algebras\page{1}\endtitle
\head Continuous complex-valued functions\page{1}\endhead
...
\title Bibliography\page{307}\endtitle
\endtoc
\enddocument
```

The chapter titles listed in the table of contents are typed in the same way as in actual use. To get page numbers in the table of contents, use `\page` as shown, just before the ending of an element. This option is available for all levels of headings.

In a monograph using the preprint style, the chapter title is used for the left running head and the text of section headings (from `\head`) appears as the right running head. It's not uncommon for the text of a heading to be too long to fit in the running head width; in such a case use `\rightheadtext` to specify a shortened form of the heading for use in the running heads:

```
\head Fourier coefficients of continuous periodic functions
of bounded entropy norm\endhead
\rightheadtext{Fourier coefficients of periodic functions}
```

This should follow immediately after the `\head`, to ensure that both take effect on the same page. If the chapter title is too long to fit as a running head, a shortened form can be supplied in a similar way with `\leftheadtext` immediately after the `\title`. See also the section **Running Heads**.

The style for a chapter of a monograph differs in some particulars from the style for a paper. The text of a `\head` will be boldface instead of small caps; headings of theorems, propositions, definitions, remarks, etc. will be small caps instead of boldface, and indented rather than flush left.

### Inserts with Captions (new entry, *Joy*, p. 168)

Figures, tables, and some other kinds of objects are often handled as inserts. These objects may be prepared separately from the main document and pasted in, in which case space must be left for them. These objects usually have captions; a caption may be positioned above (for a table) or below (for a figure).

An insert may be specified for the top or “middle” of a page, i.e., right where the input for the insert occurs in the text. These are typed as `\topinsert` and `\midinsert` respectively. Furthermore, a caption may be placed at the top or the bottom of the insert, using the tags `\topcaption` and `\botcaption` respectively.

The general structure used to specify an insert with a caption at the top is:

```

\topinsert or \midinsert
\captionwidth{<dimen>} (optional)
\topcaption{<caption label>}
  <optional caption text>
\endcaption
\vspace{<dimen>} or <optional code for the insertion body>
\endinsert

```

If a bottom caption was desired, `\topcaption` would be replaced by `\botcaption`, and the `\vspace{<dimen>}` option (or the optional code for the insertion body) would be moved before the `\botcaption` macro.

The `\vspace{<dimen>}` option would be used to leave blank space for an object to be pasted into place. If a `<dimen>` is specified, its value should be the exact height of the object to be pasted in. Extra space around the object and the caption are dependent on the document style, and will be provided automatically.

The `\captionwidth{<dimen>}` option may be used to override the default caption width specified by the document style.

The `<caption label>` is something like “Figure 1” or “Table 2a”. Do not type any final punctuation; it will be provided. The caption label will be set in caps and small caps.

The `<optional caption text>` is any descriptive text that may be desired. The preprint style will set this in roman. Even if there is no text, the `\endcaption` tag must be present.

If you choose to include the  $\text{T}\text{E}\text{X}$  code for a figure, table, or other captioned object in the input, then omit the `\vspace{<dimen>}` line and type the code after the `\endcaption` and before `\endinsert`. The size will be calculated automatically, and the caption set in the appropriate location above or below the object.

Sometimes a table is small enough that it is not necessary to put it in an insert. If the caption is to appear above it, input can be typed as follows:

```

\topcaption{<caption label>}
  <optional caption text>
\endcaption
  <code for the table body>

```

The form of the input would be the following if the caption is to appear below:

```

  <code for the table body>
\botcaption{<caption label>}
  <optional caption text>
\endcaption

```

This form of “insertion” should be used only for very small objects.

**Page Numbers** (*Joy*, p. 178)

If you are using the preprint style, page numbers will appear in the running heads, at the outside margin, except for the first page, where the running head will be omitted and the page number will be centered at the bottom of the page.

If you wish to omit page numbers, type `\NoPageNumbers` at the beginning of the document (after the `\documentstyle` line). The running head text will remain; see also **Running Heads**.

In the previous version of the preprint style you could not get roman numeral page numbers, e.g. for a table of contents or preface. Now you can, using the normal  $\text{T}\text{E}\text{X}$  convention of `\pageno` plus a negative number.

**Page Size** (*Joy*, p. 178)

In the preprint style, the default page width is 30pc, and the default height is 47.5pc. You can change the size of the page by typing

```
\pagewidth{(dimen)}
\pageheight{(dimen)}
```

using suitable `(dimen)`s, where by this notation we mean a valid  $\text{T}\text{E}\text{X}$  dimension as described in the **Dimensions** section of *Joy*, Chapter 20, pp. 154–55.

**QED** (*Joy*, p. 181)

In the preprint style, `\qed` now gives an open box ‘□’, separated from what precedes it by a quad of space. It used to give a solid black box.

**Running Heads** (new entry, *Joy*, p. 183)

If you are using the preprint style, running heads similar to those in *Joy* will appear, with text in the center and page numbers to the outside. (On the first page, as usual, the running head is omitted, and the page number is placed at the bottom.)

If you do nothing to define the text of the running heads, the author's name will be used on the left-hand and the title on the right-hand pages. (This is the style for papers; for monographs, see below.) If you want some other values, say a shortened title, you can redefine the text to appear on left- and right-hand pages by typing

```
\leftheadtext{(left running head text)}
\rightheadtext{(right running head text)}
```

These instructions can appear anywhere in the file, but the most common place to use them is immediately after a `\title` or `\author` or `\head` to override the automatic running head text. If `\rightheadtext` or `\leftheadtext` is specified above the `topmatter`, `\title` and `\author` will not override them.

If you are doing a monograph rather than a journal article, and use the `\Monograph` switch, it affects the running heads as follows: The chapter title appears in the left-hand running heads, and the text of the current section heading (from `\head`) appears in the right-hand running heads. In chapters that don't contain any `\head`'s—for example, a foreword—both the left- and right-hand running heads will contain the chapter title.

By default, running heads will be uppercase. This is a frill that can be turned off (as it was in this Guide), by `\nofrills`, e.g.,

```
\rightheadtext\nofrills{Text of Running Head}
```

If for some reason you don't want running heads at all, type `\NoRunningHeads` at the beginning of the document (after the `\documentstyle` line). When running heads are omitted, page numbers will appear centered at the bottom of the page. (And even those can be turned off using `\NoPageNumbers`.)

In a monograph, if you don't want the text from the section `\head's` to appear in the running heads you must redefine the internal command, `\headmark`, that is used by `\head` to set the right-hand running head. To do this, put the following line in your document file, after `\Monograph` and before `\topmatter`:

```
\redefine\headmark#1{}
```

(where the #1 is an argument number as explained in *Joy*, p. 127ff).

### Tables (new entry, *Joy*, p. 186)

There are no special macros to support the creation of tables in  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$ . Table macro packages are available from other sources. See **Inserts with Captions** above for more information.

### Appendix B: Bibliographies (*Joy*, pp. 247–48)

The references section of a paper begins with `\Refs`. Previously it was not required that the end of the references be marked, and no command existed to do so. Although the references comprise the last section of most papers, sometimes a survey paper will have small bibliography sections scattered throughout. Since `\Refs` switches to eight-point type and makes a few other changes behind the scenes, it is hard to reestablish the main style unless each such reference section is ended cleanly. The references section of a paper now needs `\endRefs` at the end.

The references are set with hanging indentation. The amount of indentation is preset to accommodate the most common case, two-digit numbers. It can be increased (or decreased) by specifying the widest number or key used in the references. For example,

```
\widestnumber\no{999}
\widestnumber\key{GHMaR}
```

will increase the indentation to accommodate a three-digit number or the key `[GHMaR]` respectively. Note that the parts of the formatting that depend on the current journal style are taken into account automatically (the period after a number or the `[ ... ]` around a key, plus the usual space). You can also specify `\widestnumber\no{9}` to reduce the indentation from two digits' worth to one, if your bibliography has fewer than ten entries.

For letter labels typed using `\key` it is no longer necessary to type anything other than the letters themselves. A label that would formerly have been typed `\key[{\bf C1}]` is now typed `\key C1`.

Formerly there were three ways of entering an author name: `\by`, `\manyby`, and `\bysame`. For consecutive references by the same author(s), you were required to

use `\manyby` for the first one, and `\bysame` for the rest. Now `\manyby` is obsolete, and will result in an error message if used. Instead, `\by` is used for the first reference by an author, and `\bysame`, as before, is used for subsequent ones. The horizontal line produced by `\bysame` formerly varied according to the typeset width of the author's name; now it has a fixed length of three ems.

There are four new options: `\ed`, `\eds`, `\lang`, and `\transl`.

Two variations are provided for entering editor names, as with `\page` and `\pages`, because the note "ed." or "eds." is part of the automatic formatting.

`\lang` is used to indicate the original language for papers where bibliographic information has been translated or there is some other reason to believe that the original language cannot be correctly identified from information in the reference.

In the new version of the preprint style `\nofrills` can be used to keep automatic punctuation from appearing. `\nofrills\bookinfo` suppresses the comma that would normally precede the `\bookinfo` information, while `\bookinfo\nofrills...` suppresses the comma or other punctuation that would normally appear at the end of the `\bookinfo` information. In keeping with this idea, `\finalinfo` now inserts the ending period automatically. It can be suppressed with `\finalinfo\nofrills`. Automatic punctuation will no longer be added if the pertinent field was included but left blank. For instance, the sequence

```
...
\book Title of Book
\bookinfo
\publ Publisher Name
...
```

would formerly have given an extra comma after the book title.

Some examples will illustrate these new tags. See the appendix for samples of input and output.

### 3. MATHEMATICAL CONSTRUCTIONS

#### Wide Accents in Math Mode (*Joy*, p. 134)

There are now wider versions of the `\widehat` and `\widetilde` accents; they appear on lines (5) and (6):

(1) <code>\$\$\hat x, \tilde x\$</code>	$\hat{x}, \tilde{x}$
(2) <code>\$\$\widehat x, \widetilde x\$</code>	$\widehat{x}, \widetilde{x}$
(3) <code>\$\$\widehat{xy}, \widetilde{xy}\$</code>	$\widehat{xy}, \widetilde{xy}$
(4) <code>\$\$\widehat{xyz}, \widetilde{xyz}\$</code>	$\widehat{xyz}, \widetilde{xyz}$
(5) <code>\$\$\widehat{xyzu}, \widetilde{xyzu}\$</code>	$\widehat{xyzu}, \widetilde{xyzu}$
(6) <code>\$\$\widehat{xyzuv}, \widetilde{xyzuv}\$</code>	$\widehat{xyzuv}, \widetilde{xyzuv}$

These new accents are in the `msbm` family. If `msbm` has been loaded, `\widehat` and `\widetilde` will automatically select these wider versions when required; otherwise, the characters on line (4) will be the largest available. If you are using the preprint style, `msbm` is loaded automatically; otherwise, see the section entitled **Fonts** for instructions on loading it.

**Tabs in Matrices** (*Joy*, pp. 175–76)

The `TAB` key can no longer be used to separate columns of a matrix. Only `&` can be used for that purpose.

The `TAB` is treated exactly like a space by  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$ , so it is still possible to type a matrix that will look like a matrix on your screen, as long as you include an `&` along with the spaces.

`\enabletabs`, `\disabletabs`, `\Enabletabs` and `\Disabletabs` are undefined in  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  2.0 and will result in an error message if they occur in your input file.

## 4. FONTS

**Additional fonts for  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$** 

A number of new fonts have been created for use with  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  2.0, both Computer Modern fonts in sizes not previously available and new fonts of alphabets and symbols intended to be used for mathematical notation. These fonts are in the collection `AMSFonTS` Version 2.0. They must be installed on your computer before you can use  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$ 's preprint style or otherwise refer to them. Note that `AMSFonTS` Version 2.0 cannot be used with versions of  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  earlier than Version 2.0, and vice versa.

Several of these fonts are made available automatically by the preprint style and others can be loaded on demand. The fonts available and the commands used to load them are described below.

*Fonts loaded with the preprint style.* Several fonts are loaded automatically for general use.

- `cmcsc8` is a new size of the Computer Modern small caps font.
- `cmex8` and `cmex7` are new sizes of the Computer Modern math extension font. `cmex8` is used by the preprint style in abstracts and other eight-point environments; `cmex7` is used for all sub- and superscripts.

*Math fonts loaded with the preprint style.*

- `msam` and `msbm` contain extra symbols. The symbols and the names that will produce them are shown in the section **Symbol Names** below. If you are not using the preprint style, each can be loaded separately by `\loadmsam` or `\loadmsbm` as appropriate.
- `eufm` is the medium-weight Euler Fraktur (German) font. It can also be loaded by `\loadeufm` if the preprint style is not being used.

*Math fonts loaded by `\loadbold`.* See the sections below on **Bold Characters in Math Mode** and **Bold Greek Letters** for details on accessing particular characters in these fonts.

- `cmmib` is Computer Modern bold math italic. It also contains bold Greek.
- `cmbsy` contains Computer Modern bold math symbols.

*Additional Euler fonts, for use in math.*

- `eufb`, `\loadeufb`, is bold Fraktur.

- `eusm`, `\loadeusm`, is medium-weight script.
- `eusb`, `\loadeusb`, is bold script.
- `eurm`, `\loadeurm`, is medium-weight “cursive roman.”
- `eurb`, `\loadeurb`, is bold “cursive roman.”

*Considerations and warnings.* The commands to load these font files should be typed in the preamble area between the `\documentstyle{...}` line and the `\topmatter`. Once any of these files is loaded, it will be available automatically for use in math mode.

$\mathcal{T}\mathcal{E}\mathcal{X}$  can accommodate only sixteen font families in math mode; seven are already defined before  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  begins, and the preprint style loads three more, for a total of ten. For this reason, you should load additional fonts with care, requesting only those you know for certain you will need.

All the fonts described here, and some others as well, are included in the collection  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts Version 2.0, which is available from the AMS and other distributors. The math fonts mentioned here are all supplied in sizes from five through ten point, suitable for use in mathematical text.

### Bold Characters in Math Mode (*Joy*, pp. 160–62)

Bold letters are still obtained by `\bold` as described in *Joy*. In addition, bold symbols, italic, and lowercase Greek can now be obtained once `\loadbold` appears in the file. Two control sequences are used for different kinds of bold symbols:

<code>\boldkey</code>	for symbols that actually appear on the keyboard
<code>\boldsymbol</code>	for symbols specified by a single control sequence

For example,

`\bold x \boldsymbol\in \boldsymbol\varGamma`

gives

$$x \in \Gamma$$

[and `\boldsymbol\lbrack a \boldsymbol\rbrack` gives  $[a]$ , if you need to use `\lbrack` and `\rbrack` instead of the `[` and `]` keys].

More precisely, `\boldkey` can be used in math formulas in the following combinations:

- With any of the symbols

`+ - = < > ( ) [ ] | / * . , : ; ! ?`

to give

`+ - = < > ( ) [ ] | / * . , : ; ! ?`

But `\bold` cannot be used to get bold versions of these symbols. `\bold+` will give only the ordinary `+`, etc.

The bold `+` and `-` will be binary operators, like the ordinary `+` and `-` symbols; the bold `=` will be a binary relation, like the ordinary `=`, etc.

- With letters:

`\boldkey a$, ..., \boldkey z$`  $a, \dots, z$

$\text{\boldkey A\$}$ , ...,  $\text{\boldkey Z\$}$   $\mathbf{A}, \dots, \mathbf{Z}$

Notice that these are *bold math italic* letters, as opposed to the bold text letters  $\mathbf{a}, \dots, \mathbf{z}, \mathbf{A}, \dots, \mathbf{Z}$  that you get by using  $\text{\bold}$  in math mode.

- With numbers:

$\text{\boldkey 0\$}$ , ...,  $\text{\boldkey 9\$}$   $\mathbf{0}, \dots, \mathbf{9}$

However, these combinations simply give the same numerals that you get with  $\text{\bold0\$}$ , ...,  $\text{\bold9\$}$ .

The  $\text{\boldsymbol}$  construction can be used in any of the following combinations:

- With uppercase and lowercase Greek letters

$\text{\boldsymbol\Gamma\$}$ , ...,  $\text{\boldsymbol\Omega\$}$   $\mathbf{\Gamma}, \dots, \mathbf{\Omega}$   
 $\text{\boldsymbol\varGamma\$}$ , ...,  $\text{\boldsymbol\varOmega\$}$   $\mathbf{\Gamma}, \dots, \mathbf{\Omega}$   
 $\text{\boldsymbol\alpha\$}$ , ...,  $\text{\boldsymbol\omega\$}$   $\alpha, \dots, \omega$

In previous versions of  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\text{\TeX}$ , bold unslanted uppercase Greek letters  $\mathbf{\Gamma}, \dots, \mathbf{\Omega}$  were specified by  $\text{\boldGamma}, \dots, \text{\boldOmega}$ ; these control sequences have now disappeared.

- For convenience,  $\text{\boldsymbol}$  may also be followed by a letter (but not by a number or other character), giving the same result as  $\text{\boldkey}$ .
- You can also apply  $\text{\boldsymbol}$  to all the other standard symbols that are specified by single control sequences. For example, to get bold primes:

$\text{\boldsymbol\prime\$}$   $\mathbf{\prime}$   
 $\text{\boldsymbol A^{\boldsymbol\prime}\$}$   $\mathbf{A'}$

(But  $\text{\boldsymbol\prime}$ , using the shorthand notation for  $\text{\prime}$ , won't work.)

- You can apply  $\text{\boldsymbol}$  to “delimiters,” such as

$\text{\boldsymbol\{ ... \boldsymbol\}\$}$   $\{\dots\}$   
 $\text{\boldsymbol\langle ... \boldsymbol\rangle\$}$   $\langle\dots\rangle$   
 $\text{\boldsymbol|, \boldkey|, \boldsymbol\|\$}$   $|, |, ||, ||$   
 $\text{\boldsymbol\vert, \boldsymbol\Vert, \boldsymbol\Verth\$}$   $|, |, ||, ||$

However, you can't use  $\text{\boldsymbol}$  after  $\text{\left}$  and  $\text{\right}$ . In particular, typing  $\text{\left\boldsymbol| ... \right\boldsymbol|}$  will produce only error messages.

- Certain symbols on the bold fonts can't be accessed at all via  $\text{\boldkey}$  or  $\text{\boldsymbol}$ : These include bold versions  $\mathbf{\mathcal{A}}, \dots, \mathbf{\mathcal{Z}}$  of the “calligraphic letters”  $\mathcal{A}, \dots, \mathcal{Z}$  that you type as  $\text{\Cal A}, \dots, \text{\Cal Z}$ , and bold versions  $\mathbf{o}, \dots, \mathbf{g}$  of the oldstyle numbers  $o, \dots, g$  that you get with  $\text{\oldnos}$ . If you really need to have these symbols, you will have to enlist the aid of a  $\text{\TeX}$ nician, or use  $\text{\pmb}$ .

**Fraktur Font** (*Joy*, p. 162)

The German Fraktur font, which is defined only in math mode, can be made available by typing `\loadeufr` at the top of your paper, before `\documentstyle`. If you are using the preprint style, medium-weight Fraktur is loaded automatically. To produce a Fraktur letter, type

<code>\$\$\frak g\$</code>	$\mathfrak{g}$
<code>\$\$\frak A\$, \dots, \$\frak Z\$</code>	$\mathfrak{A}, \dots, \mathfrak{Z}$

**Blackboard Bold** (*Joy*, p. 162)

$\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  now has a “blackboard bold” font, `\Bbb`. Like `\Ca1`, it will work only in math mode, and only when applied to uppercase letters. This alphabet is part of the `msbm` font, and can be made available by typing `\loadmsbm` at the top of your file. (It is loaded automatically with the preprint style.)

<code>\$\$\Bbb A, \Bbb C, \Bbb R\$, etc.</code>	$\mathbb{A}, \mathbb{C}, \mathbb{R}, \text{etc.}$
---	---

**Poor Man's Bold** (*Joy*, p. 181)

$\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  now has boldface versions of most math symbols. However, if you need only one or two bold symbols and have run out of  $\mathcal{T}\mathcal{E}\mathcal{X}$  capacity for new fonts or font families, you can always get a poor man's bold version of bold with `\pmb`, as described in *Joy*.

**Bold Greek Letters** (*Joy*, p. 255)

Bold Greek letters, both lowercase and uppercase, can be obtained by using the `\boldsymbol` construction, as described in **Bold Characters in Math Mode**.

The old control sequences, `\boldGamma`, `\boldOmega`, `\boldSigma`, `\boldTheta`, `\boldPhi`, `\boldPsi`, `\boldChi`, `\boldPsi`, `\boldOmega`, have now disappeared. The upright uppercase bold Greek letters are part of the ordinary bold font. However, the lowercase and slanted letters are not loaded automatically, so you must specify `\loadbold` before using them.

## 5. SYMBOL NAMES

The symbols in the `msam` and `msbm` fonts have been assigned “standard” control sequence names as shown below. All the symbol names are loaded automatically by the preprint style; if you are not using the preprint style, the command `\UseAMSsymbols` will have the same effect. (Both fonts must already have been installed or error messages will result.) This will add about 200 new control sequences to  $\mathcal{T}\mathcal{E}\mathcal{X}$ 's internal table. If you are short on space, or need only a few of the symbols, you can use a different approach to access just the ones you need. See the section **The `\newsymbol` command** below.

**Special symbols and Blackboard Bold letters**

Certain symbols from the `msam` family can be specified by control sequences that will be defined as soon as the command `\loadmsam` has appeared in the file.

First there are four symbols that are normally used outside of math mode:

✓	<code>\checkmark</code>	Ⓜ	<code>\circledR</code>
✕	<code>\maltese</code>	¥	<code>\yen</code>

These symbols, like ¶, §, †, and ‡, can also be used in math mode, and will change sizes correctly in subscripts and superscripts.

Next are four symbols that are “delimiters” (although there are no larger versions obtainable with `\left` and `\right`), so they must be used in math mode:

⌈	<code>\ulcorner</code>	⌋	<code>\urcorner</code>
⌌	<code>\llcorner</code>	⌍	<code>\lrcorner</code>

Finally, two dashed arrows are constructed from symbols in this family. Note that one of them has two names; it can be accessed by either one:

--> `\dashrightarrow`, `\dasharrow`    <--> `\dashleftarrow`

The Blackboard Bold letters  $\mathbb{A}, \dots, \mathbb{Z}$  appear in the `msbm` family. Once `\loadmsbm` has appeared in the file, they can be typed (in math mode) as `\Bbb A, \dots, \Bbb Z`.

The `msbm` family also contains wider versions of the `\widehat` and `\widetilde` as described in Chapter 20, “Wide accents in math mode.”

### The `\newsymbol` command

All other symbols of the `msam` and `msbm` fonts must be named by control sequences so that they can be used (in math mode only) when the fonts are loaded. This can be done all at once by typing the instruction `\UseAMSsymbols`, which will load in the file `AMSSYM.TEX`. This instruction is included in the preprint style, so the names are assigned automatically, which requires over 200 control sequences.

If you are very short on space for control sequence names, and need only a few of these symbols, you can omit `\UseAMSsymbols`. Instead, assign only the names you will need by using a new  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  control sequence `\newsymbol` to create a control sequence that will properly produce this symbol. The control sequence can be either the “standard” name, as listed below, or one of your own choosing.

The list of symbols below shows for each symbol the symbol itself, a four-character “ID,” and the “standard” name of the symbol. (The first character of the ID identifies the font family in which a symbol resides. Symbols from the `msam` family have 1 as the first character; symbols from the `msbm` family have 2 as the first character.) For example, the symbol  $\not\leq$  appears as

$\not\leq$     230A    `\nleqslant`

To produce a control sequence with this name, the instruction

`\newsymbol\nleqslant 230A`

appears in the file `AMSSYM.TEX`. This same instruction can be typed by a user who is not using the preprint style and has chosen not to load all the symbol names by `\UseAMSsymbols`. Thereafter, the control sequence `\nleqslant` will produce the symbol  $\not\leq$  (in math mode), and will act properly as a “binary relation.”

A few symbols in these fonts replace symbols defined in `PLAIN.TEX` by combinations of symbols available in the Computer Modern fonts. These are `\angle` ( $\sphericalangle$ ) and `\hbar` ( $\hbar$ ) from the group “Miscellaneous symbols,” and `\rightleftharpoons` ( $\rightleftharpoons$ )

from the group “Arrows” below (and *Joy*, p. 257). The new symbols will change sizes correctly in subscripts and superscripts, provided that you are using appropriate redefinitions. In order to use `\newsymbol` to replace an existing definition, the name must first be “undefined.” Here are the lines you must put in your file if you are not using the preprint style or `\UseAMSsymbols` (which perform the redefinition automatically):

```
\undefine\angle
\newsymbol\angle 105C
\undefine\hbar
\newsymbol\hbar 207E
\undefine\rightleftharpoons
\newsymbol\rightleftharpoons 130A
```

These symbols are flagged in the tables below with a “(U)” as a reminder that they must be undefined.

Note in the tables that some symbols are shown with two names. In such cases, either one can be used to access the symbol.

- **Lowercase Greek letters**

$F$	207A	<code>\digamma</code>	$\approx$	207B	<code>\varkappa</code>
-----	------	-----------------------	-----------	------	------------------------

- **Hebrew letters**

$\beth$	2069	<code>\beth</code>	$\gimel$	206A	<code>\gimel</code>
$\daleth$	206B	<code>\daleth</code>			

- **Miscellaneous symbols**

$\hbar$	207E	<code>\hbar</code> (U)	$\backprime$	1038	<code>\backprime</code>
$\hslash$	207D	<code>\hslash</code>	$\varnothing$	203F	<code>\varnothing</code>
$\triangle$	134D	<code>\vartriangle</code>	$\blacktriangle$	104E	<code>\blacktriangle</code>
$\nabla$	104F	<code>\triangledown</code>	$\blacktriangledown$	1048	<code>\blacktriangledown</code>
$\square$	1003	<code>\square</code>	$\blacksquare$	1004	<code>\blacksquare</code>
$\lozenge$	1006	<code>\lozenge</code>	$\blacklozenge$	1007	<code>\blacklozenge</code>
$\textcircled{S}$	1073	<code>\circledS</code>	$\bigstar$	1046	<code>\bigstar</code>
$\angle$	105C	<code>\angle</code> (U)	$\sphericalangle$	105E	<code>\sphericalangle</code>
$\sphericalangle$	105D	<code>\measuredangle</code>			
$\nexists$	2040	<code>\nexists</code>	$\complement$	107B	<code>\complement</code>
$\mho$	2066	<code>\mho</code>	$\eth$	2067	<code>\eth</code>
$\Finv$	2060	<code>\Finv</code>	$\diagup$	231E	<code>\diagup</code>
$\Game$	2061	<code>\Game</code>	$\diagdown$	231F	<code>\diagdown</code>
$\Bbbk$	207C	<code>\Bbbk</code>			

- **Binary operators**

$\dotplus$	1275	<code>\dotplus</code>	$\ltimes$	226E	<code>\ltimes</code>
$\smallsetminus$	2272	<code>\smallsetminus</code>	$\rtimes$	226F	<code>\rtimes</code>
$\Cap$	1265	<code>\Cap</code> , <code>\doublecap</code>	$\leftthreetimes$	1268	<code>\leftthreetimes</code>
$\Cup$	1264	<code>\Cup</code> , <code>\doublecup</code>	$\rightthreetimes$	1269	<code>\rightthreetimes</code>

$\bar{\wedge}$	125A	<code>\barwedge</code>	$\curlywedge$	1266	<code>\curlywedge</code>
$\veebar$	1259	<code>\veebar</code>	$\curlyvee$	1267	<code>\curlyvee</code>
$\bar{=}$	125B	<code>\doublebarwedge</code>			
$\boxminus$	120C	<code>\boxminus</code>	$\circ$	127F	<code>\circleddash</code>
$\boxtimes$	1202	<code>\boxtimes</code>	$\otimes$	127E	<code>\circledast</code>
$\boxdot$	1200	<code>\boxdot</code>	$\odot$	127D	<code>\circledcirc</code>
$\boxplus$	1201	<code>\boxplus</code>	$\cdot$	1205	<code>\centerdot</code>
$*$	223E	<code>\divideontimes</code>	$\intercal$	127C	<code>\intercal</code>

### • Binary relations






























$\leqq$	1335	<code>\leqq</code>	$\geqq$	133D	<code>\geqq</code>
$\leqslant$	1336	<code>\leqslant</code>	$\geqslant$	133E	<code>\geqslant</code>
$\leqslantless$	1330	<code>\leqslantless</code>	$\geqslantgtr$	1331	<code>\geqslantgtr</code>
$\lesssim$	132E	<code>\lesssim</code>	$\gtrsim$	1326	<code>\gtrsim</code>
$\lessapprox$	132F	<code>\lessapprox</code>	$\gtrapprox$	1327	<code>\gtrapprox</code>
$\approxeq$	2375	<code>\approxeq</code>			
$\lessdot$	236C	<code>\lessdot</code>	$\gtrdot$	236D	<code>\gtrdot</code>
$\lll, \llless$	136E	<code>\lll, \llless</code>	$\ggg, \gggtr$	136F	<code>\ggg, \gggtr</code>
$\lessgtr$	1337	<code>\lessgtr</code>	$\gtrless$	133F	<code>\gtrless</code>
$\lesseqgtr$	1351	<code>\lesseqgtr</code>	$\gtreqless$	1352	<code>\gtreqless</code>
$\lesseqqgtr$	1353	<code>\lesseqqgtr</code>	$\gtreqqless$	1354	<code>\gtreqqless</code>
$\doteqdot, \Doteq$	132B	<code>\doteqdot, \Doteq</code>	$\eqcirc$	1350	<code>\eqcirc</code>
$\risingdotseq$	133A	<code>\risingdotseq</code>	$\circeq$	1324	<code>\circeq</code>
$\fallingdotseq$	133B	<code>\fallingdotseq</code>	$\triangleq$	132C	<code>\triangleq</code>
$\backsimeq$	1376	<code>\backsimeq</code>	$\thicksim$	2373	<code>\thicksim</code>
$\backsimeq$	1377	<code>\backsimeq</code>	$\thickapprox$	2374	<code>\thickapprox</code>
$\subseteqq$	136A	<code>\subseteqq</code>	$\supseteqq$	136B	<code>\supseteqq</code>
$\Subset$	1362	<code>\Subset</code>	$\Supset$	1363	<code>\Supset</code>
$\sqsubset$	1340	<code>\sqsubset</code>	$\sqsupset$	1341	<code>\sqsupset</code>
$\preccurlyeq$	1334	<code>\preccurlyeq</code>	$\succcurlyeq$	133C	<code>\succcurlyeq</code>
$\curlyeqprec$	1332	<code>\curlyeqprec</code>	$\curlyeqsucc$	1333	<code>\curlyeqsucc</code>
$\prec$	132D	<code>\prec</code>	$\succsim$	1325	<code>\succsim</code>
$\precapprox$	2377	<code>\precapprox</code>	$\succapprox$	2376	<code>\succapprox</code>
$\vartriangleleft$	1343	<code>\vartriangleleft</code>	$\vartriangleright$	1342	<code>\vartriangleright</code>
$\trianglelefteq$	1345	<code>\trianglelefteq</code>	$\trianglerighteq$	1344	<code>\trianglerighteq</code>
$\vDash$	130F	<code>\vDash</code>	$\Vdash$	130D	<code>\Vdash</code>
$\Vvdash$	130E	<code>\Vvdash</code>			
$\smile$	1360	<code>\smile</code>	$\shortmid$	2370	<code>\shortmid</code>
$\frown$	1361	<code>\frown</code>	$\shortparallel$	2371	<code>\shortparallel</code>
$\bumpeq$	136C	<code>\bumpeq</code>	$\between$	1347	<code>\between</code>
$\Bumpeq$	136D	<code>\Bumpeq</code>	$\pitchfork$	1374	<code>\pitchfork</code>
$\varpropto$	135F	<code>\varpropto</code>	$\backepsilon$	237F	<code>\backepsilon</code>
$\blacktriangleleft$	134A	<code>\blacktriangleleft</code>	$\blacktriangleright$	1349	<code>\blacktriangleright</code>
$\therefore$	1329	<code>\therefore</code>	$\because$	132A	<code>\because</code>

### • Negated relations

$\nless$	2304	<code>\nless</code>	$\ngtr$	2305	<code>\ngtr</code>
----------	------	---------------------	---------	------	--------------------

	2302 \nleq		2303 \ngeq
	230A \nleqslant		230B \ngeqslant
	2314 \nleqq		2315 \ngeqq
	230C \lneq		230D \gneq
	2308 \lneqq		2309 \gneqq
	2300 \lvertneqq		2301 \gvertneqq
	2312 \lnsim		2313 \gnsim
	231A \lnapprox		231B \gnapprox
	2306 \nprec		2307 \nsucc
	230E \npreceq		230F \nsucceq
	2316 \precneqq		2317 \succneqq
	2310 \precnsim		2311 \succnsim
	2318 \precnapprox		2319 \succnapprox
	231C \nsim		231D \ncong
	232E \nshortmid		232F \nshortparallel
	232D \nmid		232C \nparallel
	2330 \nvdash		2332 \nvDash
	2331 \nVDash		2333 \nVDash
	2336 \ntriangleleft		2337 \ntriangleright
	2335 \ntrianglelefteq		2334 \ntrianglerighteq
	232A \nsubseteq		232B \nsupseteq
	2322 \nsubseteqq		2323 \nsupseteqq
	2328 \subsetneq		2329 \supsetneq
	2320 \varsubsetneq		2321 \varsupsetneq
	2324 \subsetneqq		2325 \supsetneqq
	2326 \varsubsetneqq		2327 \varsupsetneqq

### • Arrows

	1312 \leftleftarrows		1313 \rightrightarrows
	131C \leftrightarrows		131D \rightleftarrows
	1357 \Lleftarrow		1356 \Rrightarrow
	1311 \twoheadleftarrow		1310 \twoheadrightarrow
	131B \leftarrowtail		131A \rightarrowtail
	1322 \looparrowleft		1323 \looparrowright
	130B \leftrightharpoons		130A \rightleftharpoons (U)
	2378 \curvearrowleft		2379 \curvearrowright
	1309 \circlearrowleft		1308 \circlearrowright
	131E \Lsh		131F \Rsh
	1314 \upuparrows		1315 \downdownarrows
	1318 \upharpoonleft		1316 \upharpoonright, \restriction
	1319 \downharpoonleft		1317 \downharpoonright
	1328 \multimap		1320 \rightsquigarrow
	1321 \leftrightsquigarrow		

### • Negated arrows

	2320 \leftarrow		2339 \rightarrow
---	-----------------	---	------------------

$\Leftrightarrow$ 233A <code>\nLeftarrow</code>	$\Rrightarrow$ 233B <code>\nRightarrow</code>
$\Leftrightarrow$ 233D <code>\nlefttriarrow</code>	$\Leftrightarrow$ 233C <code>\nlefttriarrow</code>

## 6. OTHER THINGS YOU OUGHT TO KNOW

### Errata to *The Joy of $\mathcal{T}\mathcal{E}\mathcal{X}$* prior to $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$ 2.0

The file `JOYERR.TEX` contains the full list of corrections to *Joy* that preceded the release of  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  Version 2.0. A user who desires a typeset copy of this file may run it through  $\mathcal{T}\mathcal{E}\mathcal{X}$  and print out the `.dvi` file. This will require Version 2.0 of  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  and `AMSPPT.STY`, and also `AMSFONTS` Version 2.0.

### Acknowledging the use of $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$

The following are suggested as appropriate statements of acknowledgment that  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$  has been used to format a document for publication.

A single paper should include the following at the bottom of the first page:

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## 7. GETTING HELP

If you should find any bugs in the macros or documentation, send a Problem Report to:

Technical Support Group  
 American Mathematical Society  
 P. O. Box 6248  
 Providence, RI 02940  
 Phone: 800-321-4AMS or 401-455-4080  
 Internet: [tech-support@Math.AMS.com](mailto:tech-support@Math.AMS.com)

A Problem Report should contain the following information:

- (1) version of `AMSTEX.TEX` and of `AMSPPT.STY` with which the problem occurred;
- (2) a detailed description of the problem, including the input code for one or more examples that illustrate the problem;
- (3) a log file of a  $\mathcal{T}\mathcal{E}\mathcal{X}$  session showing the problem.

## APPENDIX. SAMPLE BIBLIOGRAPHY INPUT AND OUTPUT

```
\Refs
\ref\no 4
\by V. I. Arnol$\$d, A. N. Varchenko,
  and S. M. Guse\u\i n-Zade
\book Singularities of differentiable maps.~\rm I
\publ ‘‘Nauka’’ \publaddr Moscow \yr 1982
\lang Russian
\endref

\ref\no 5\bysame
\book Singularities of differentiable maps.~\rm II
\publ ‘‘Nauka’’ \publaddr Moscow \yr 1984
\lang Russian
\endref

\ref\no 6
\by O. A. Ladyzhenskaya
\book Mathematical problems in the dynamics
  of a viscous incompressible fluid
\bookinfo 2nd rev. aug. ed.
\publ ‘‘Nauka’’ \publaddr Moscow \yr 1970
\lang Russian
\transl English transl. of 1st ed.
\book The mathematical theory of viscous
  incompressible flow
\publ Gordon and Breach \publaddr New York
\yr 1963; rev. 1969
\endref
```

```
\ref\no 7
\by P. D. Lax and C. D. Levermore
\paper The small dispersion limit for the
  KdV equation.~\rm I
\jour Comm. Pure Appl. Math. \vol 36 \yr 1983
\pages 253--290 \nofrills\finalinfo (overview)
\moreref\paper \rm II
\jour Comm. Pure Appl. Math.
\vol 36 \yr 1983 \pages 571--594
\moreref\paper \rm III
\jour Comm. Pure Appl. Math.
\vol 36 \yr 1983 \pages 809--829 \endref

\ref\no10 \by S. Osher
\paper Shock capturing algorithms for equations of
  mixed type
\inbook Numerical Methods for Partial Differential
  Equations \eds S. I. Hariharan and T. H. Moulton
\publ Longman \publaddr New York \yr 1986
\pages 305--322
\endref

\ref\no 17 \by G. S. Petrov
\paper Elliptic integrals and their nonoscillatory
  behavior
\jour Funktsional. Anal. i Prilozhen.
\vol 20 \yr 1986 \pages 46--49
\transl\nofrills English transl. in
\jour Functional Anal. Appl. \vol 20\yr 1986
\endref
```

```
\widestnumber\key{GHMaR}

\ref\key C1
\by B. Coomes
\book Polynomial flows, symmetry groups, and
  conditions sufficient for injectivity of maps
\bookinfo Ph.D. thesis, Univ. Nebraska--Lincoln
\yr 1988
\endref

\ref\key C2
\by same % B. Coomes
\paper The Lorenz system does not have a
  polynomial flow
\jour J. Differential Equations
\toappear
\endref

\ref\key GHMaR
\by J. Guckenheimer, P. Holmes, M. Martineau,
  and L. P. Robinson
\book Nonlinear oscillations, dynamical systems,
  and bifurcations of vector fields
\bookinfo
\publ Springer-Verlag \publaddr New York
\yr 1983
\endRefs
```

## REFERENCES

4. V. I. Arnol'd, A. N. Varchenko, and S. M. Guseĭn-Zade, *Singularities of differentiable maps*. I, "Nauka", Moscow, 1982. (Russian)
  5. ———, *Singularities of differentiable maps*. II, "Nauka", Moscow, 1984. (Russian)
  6. O. A. Ladyzhenskaya, *Mathematical problems in the dynamics of a viscous incompressible fluid*, 2nd rev. aug. ed., "Nauka", Moscow, 1970 (Russian); English transl. of 1st ed., *The mathematical theory of viscous incompressible flow*, Gordon and Breach, New York, 1963; rev. 1969.
  7. P. D. Lax and C. D. Levermore, *The small dispersion limit for the KdV equation*. I, *Comm. Pure Appl. Math.* **36** (1983), 253–290 (overview); II, *Comm. Pure Appl. Math.* **36** (1983), 571–594; III, *Comm. Pure Appl. Math.* **36** (1983), 809–829.
  10. S. Osher, *Shock capturing algorithms for equations of mixed type*, *Numerical Methods for Partial Differential Equations* (S. I. Hariharan and T. H. Moulton, eds.), Longman, New York, 1986, pp. 305–322.
  17. G. S. Petrov, *Elliptic integrals and their nonoscillatory behavior*, *Funktsional. Anal. i Prilozhen.* **20** (1986), 46–49; English transl. in *Functional Anal. Appl.* **20** (1986).
- [C1] B. Coomes, *Polynomial flows, symmetry groups, and conditions sufficient for injectivity of maps*, Ph.D. thesis, Univ. Nebraska–Lincoln, 1988.
- [C2] ———, *The Lorenz system does not have a polynomial flow*, *J. Differential Equations* (to appear).
- [GHMaR] J. Guckenheimer, P. Holmes, M. Martineau, and L. P. Robinson, *Nonlinear oscillations, dynamical systems, and bifurcations of vector fields*, Springer-Verlag, New York, 1983.