

**Mathematical Symbols
and Cyrillic Fonts
Ready for Distribution
(Revised)**

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The first general release of fonts created at the American Mathematical Society was in August, at the time of the TUG meeting. This first release consists of cyrillic and two 128-character fonts of mathematical symbols, all in various sizes and weights. It is our intention that these fonts be added to the standard distribution, and we will make an effort to provide the necessary files to all sites from which the \TeX package is being distributed. It will not be possible to provide this material directly to users, since the Society's DEC 20 computer has proved singularly unsuitable for making tapes that can be read by any other kind of machine.

A master tape was delivered to Stanford and installed on the Score (DEC-20) system, in the directory $\langle \text{\TeX}. \text{AMSFONTS} \rangle$. This directory now

contains the **METAFONT78** sources necessary to generate the fonts in distribution format, as well as corresponding .PXL files, along with several files of macros, documentation and user instructions. Actual addition of this material to distribution tapes (and PC diskettes) is now being arranged; information regarding the fonts was sent to all principal distribution sites, and arrangements are being made to transmit the necessary files as soon as practicable.

Readers of the original article in the last TUGboat will note that the font names presented there have been changed. (The content of the symbol fonts has also changed slightly, to omit redundancies.) We have been persuaded that the name "Euler" should be reserved for the professionally-designed fonts commissioned by the Society from Hermann Zapf—little enough recognition is given even the best font designers, without the font names associated with their work being wrongfully attributed to something that they had no hand in creating. We acknowledge our error, and hope our apology is accepted.

	'0	'1	'2	'3	'4	'5	'6	'7	
'00x	Ъ	Ь	Ц	Э	І	Є	Ђ	Ђ	"0x
'01x	ъ	ь	ц	э	і	є	ђ	ђ	
'02x	Ю	Ж					Ѕ	Я	"1x
'03x	ю	ж					ѕ	я	
'04x	"	!	"		~	%	'	'	"2x
'05x	()	*		,	-	.	/	
'06x	0	1	2	3	4	5	6	7	"3x
'07x	8	9	:	;	«	ı	»	?	
'10x		А	Б	Ц	Д	Е	Ф	Г	"4x
'11x	Х	И	Ј	К	Л	М	Н	О	
'12x	П	Ч	Р	С	Т	У	В	Щ	"5x
'13x	Ш	Ы	З	["]	Ь	Ђ	
'14x	'	а	б	ц	д	е	ф	г	"6x
'15x	х	и	ј	к	л	м	н	о	
'16x	п	ч	р	с	т	у	в	щ	"7x
'17x	ш	ы	з	—	—	№	ь	ђ	
	"8	"9	"A	"B	"C	"D	"E	"F	

The AMS cyrillic font – MСYR10

Мещанский университет, находящийся на пути к Нескучному, праздновал на днях свой пятидесятилетний юбилей. Кого возили в Титы или городскую больницу, тот, конечно, помнит здоровеннейший, трёхэтажный домище по правую руку с вывеской «Богадельная и Мещанские училища» и тому наверное встречались на пути вереницы ученических пар, солидно прогуливаемых надзирателями.

Cyrillic

The cyrillic font contains all letters found in the modern (post-revolutionary) cyrillic alphabet, as well as others found by Mathematical Reviews to be necessary for rendering bibliographic information in Russian, Ukrainian, Serbian, Georgian, and other Slavic and non-Slavic languages ordinarily published in cyrillic. Accents which normally occur in these languages, as well as in such words as names of mathematicians whose work is regularly translated into Russian or one of the other languages covered by MR, are included in the font, as are all the digits and ordinary punctuation. Several cells are still empty: the number of such cells is not sufficient to hold all the additional pre-revolutionary Russian letters, and there is not yet enough experience to indicate what else might most usefully (for MR) be included.

The "basic" cyrillic font is MCRY10. Names have been assigned to a number of variations, not all of which exist yet. (In particular, there are no plans yet to create the METAFONT descriptions of the true "italic" letters.)

MCRY lightface	MCSL slanted
MCB bold	MCBSL bold slanted
MCBX bold extended	MCSS sans serif
MCI italic	MCSB bold sans serif
MCBI bold italic	

Font names have been assigned so that compression to 6 characters, using the first 3 and last 3 letters of longer names (a standard built into most implementations of T_EX for operating systems having such a limit, and announced through T_EXhax by David Fuchs), will always be unique.

Keying of cyrillic to be rendered with this font is in accord with the current MR transliteration scheme, e.g.

Khrushchëv (Khrushch\`ev) → Хрущёв

Zhurnal (Zhurnal) → Журнал

Kiiv (Ki{"i}v) → Київ

`\font\tencyr=mcyr10 \def\cyr{\tencyr\cy racc}`
`{\cyr ...}` sets the stage for proper transition to and from cyrillic. Most of the translation from keyed input to cyrillic is implemented by ligature instructions in the font itself. A few letters require a "chain" of ligatures: sh → ш, shc → 7 (an obvious absurdity, but the roman combination never occurs legitimately), shch → щ. Letters rendered with accents in transliteration are trapped by macros defined in the file CYRACC.DEF: `ı̇ (\uı̇) → й`, `ī (\=ı̇) → і`, `ï (\\"ı̇) → і̇`. Both the macro accent traps and ligatures do the right thing in ordinary roman text and in `{\cyr ...}`; however, cyrillic items

in tables cannot reliably be specified in the preamble, and in individual cells `\cyr` should be preceded by `\relax` to prevent premature expansion, and thus loss, of the macro instructions.

Hyphenation is not automatically suppressed, but the patterns used will be those for English in the absence of a local override. (We do not know whether any Russian patterns exist.) For short passages, as the above sample, or isolated words, good luck may prevail.

Documentation accompanying this font will include full keying instructions, the ligature specifications, and, of course, CYRACC.DEF. Should the transliteration scheme in local use be different from the MR scheme (for example, an earlier MR scheme rendered ш as šč), it should be quite easy to modify CYRACC.DEF to accommodate it, and, if ligature changes are absolutely necessary, they may be implemented using the T_EXware programs TftoPL and PLtoTF.

Mathematical symbols

Mathematicians expanding the boundaries of their chosen areas often find that no suitably unambiguous notation exists with which to express new concepts. First attempts usually consist in seeking out ever more exotic alphabets, but this fount is rather rapidly exhausted. Non-alphabetic symbols modeled after, or constructed from combinations of, existing ones is probably the next most profitable approach. And failure in either of those attempts may yield something truly new. In any event, the net result is proliferation of symbols beyond what is available to most ordinary typesetting systems.

The original symbol fonts, CMSY and CMEX (currently AMSY and AMEX), contain the most frequently used mathematical symbols, plus whatever else was needed for *The Art of Computer Programming*, volume 2, and other projects that Don Knuth was working on at the time. Many other symbols are in common use in other subfields of mathematics, and the AMS and MR found it necessary to construct them. We have now filled one entire "extra symbols" font and most of a second.

The naming scheme devised for these "extra symbols" fonts also leaves room for a third. "Medium" and "bold" refer to the weight, medium being matched to the weight of the "basic" Computer Modern symbols in the CMSY font.

MSXM symbols 1 medium	MSXB symbols 1 bold
MSYM symbols 2 medium	MSYB symbols 2 bold
MSZM symbols 3 medium	MSZB symbols 3 bold

Negated relations.

2"04	✗	\nless	2"05	✗	\ngtr	2"1C	≈	\nsim
2"02	✗	\nleq	2"03	✗	\ngeq	2"1D	≇	\napprox
2"0A	✗	\nleqslant	2"0B	✗	\ngeqslant	2"2E	+	\nshortmid
2"14	✗	\nleqq	2"15	✗	\ngeqq	2"2F	+	\nshortparallel
2"0C	✗	\lneq	2"0D	✗	\gneq	2"2D	†	\nmid
2"08	✗	\lneqq	2"09	✗	\gneqq	2"2C	✗	\nparallel
2"00	✗	\lvertneqq	2"01	✗	\gvertneqq	2"30	✗	\nvDash
2"12	✗	\lnsim	2"13	✗	\gnsim	2"32	✗	\nvDash
2"1A	✗	\lnapprox	2"1B	✗	\gnapprox	2"31	✗	\nVDash
2"06	✗	\nprec	2"07	✗	\nsucc	2"33	✗	\nVDash
2"0E	✗	\npreceq	2"0F	✗	\nsucceq	2"36	△	\ntriangleleft
2"16	✗	\preceqq	2"17	✗	\succeqq	2"37	△	\ntriangleright
2"10	✗	\precnsim	2"11	✗	\succnsim	2"35	△	\ntrianglelefteq
2"18	✗	\precnapprox	2"19	✗	\succnapprox	2"34	△	\ntrianglerighteq
2"2A	✗	\subsetseteq	2"2B	✗	\nsupseteq			
2"22	✗	\subsetseteqq	2"23	✗	\nsupseteqq			
2"28	✗	\subsetsetneq	2"29	✗	\supsetsetneq			
2"20	✗	var. \subsetsetneq	2"21	✗	var. \supsetsetneq			
2"24	✗	\subsetsetneqq	2"25	✗	\supsetsetneqq			
2"26	✗	var. \subsetsetneqq	2"27	✗	var. \subsetsetneqq			

Arrows.

1"12	⇔	\leftleftarrows	1"13	⇒	\rightrightarrows	1"14	⇕	\upuparrows
1"1C	⇔	\leftrightarrows	1"1D	⇔	\rightleftarrows	1"15	⇓	\downdownarrows
1"57	⇐	\Lleftarrow	1"56	⇒	\Rrightarrow	1"0A	⇕	\updownarrow
1"11	↔	\twoheadleftarrow	1"10	↔	\twoheadrightarrow	1"18	↑	\upharpoonleft
1"1B	↔	\leftarrowtail	1"1A	↔	\rightarrowtail	1"19	↓	\downharpoonleft
1"22	↻	\looparrowleft	1"23	↻	\looparrowright	1"16	↑	\upharpoonright
2"78	↻	\curvearrowleft	2"79	↻	\curvearrowright	1"17	↓	\downharpoonright
1"09	○	\circlearrowleft	1"08	○	\circlearrowright	1"0B	⇕	\leftrightharpoons
1"1E	↑	\Lsh	1"1F	↑	\Rsh	1"28	⇕	\multimap
1"20	↔	\rightsquigarrow	1"21	↔	\leftrightsquigarrow			

"Negated" arrows.

2"38	↔	\nleftarrow	2"39	↔	\nrightarrow	2"3D	↔	\nleftrightarrow
2"3A	↔	\nLeftarrow	2"3B	↔	\nRightarrow	2"3C	↔	\nLeftrightarrow

Delimiters.

1"70	┌	\ulcorner	1"71	┐	\urcorner
1"78	└	\llcorner	1"79	┘	\lrcorner

Non-math symbols.

1"58	✓	\checkmark	1"72	®	\circledR
1"7A	✠	\maltese	1"55	¥	\yen

Alternate names.

1"6E	≪	\llless	1"6F	≫	\gggtr	1"2B	≐	\Doteq
1"65	⊍	\doublecap	1"64	⊎	\doublecup	1"16	↑	\restriction