Russian Typographical Traditions in Mathematical Literature

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Although the general Russian typographical traditions are already reviewed in several publications, the specifics of mathematical publication and mathematical formula presentation in Russian books and journals is still not described in full detail. This paper describes the traditions of mathematical publications and, especially, the characteristic features of the style and the graphical forms of the mathematical symbols used in mathematical notation. The ways in which these specifics can be implemented in TEX are discussed briefly as well.

Introduction

The widespread usage of computer fonts and computer-assisted typographical systems (TEX is among them) as tools in preparation of the scientific papers is surely a good event as concerns mathematical papers. Unfortunately, it also results in a trend to substitute the 'American' style of presentation for scientific papers instead of the traditions and standards formerly used in Russian scientific literature. Some changes could be accepted without problems since they really make papers more elegant, transparent and 'readable'. But in most cases such changes are just the effect of the style built into the computer program used by the scientist.

In this paper we would like to analyze the principal features specific to the traditions and standards used in Russian (and former Soviet Union) mathematical literature as compared with the presentation style used in TEX / LATEX by default. It is not the aim of this paper to criticize what is positive and what is negative in 'English' and 'Russian' styles in mathematics—we just try to describe these styles. It is also not the aim of this paper to analyze in detail how these features could be realized in TEX / LATEX—although we hope that somebody may use these data as a source for some `russmath.sty` package.

Mathematical notation

The following glyphs in Russian mathematics are different from those in TEX:

Greek letters: Greek letters typically used in Russian mathematical books are shown in figure 1. It can be seen that the lowercase letters are upright, the variant forms for Greek letters (except *theta*) are not allowed, and the graphical shape of some letters is different from that in TEX (see figure 2). (For example, for Russian publications the lowercase Greek *phi* is drawn similar to `\varphi` in TEX but as an upright [i. e., not italic] symbol.)

Functions: Several mathematical functions are defined in Russian textbooks differently:

- The names of the trigonometric functions are shown in figure 3.
- The decimal logarithm is defined as '$\lg x$'. The natural logarithm for real values is '$\ln x$' (not '$\log x$'), and for complex values it is '$\mathrm{Ln}\, z$'. The general-case logarithm is '$\log_a x$'—the notation '$\lg_a x$' is never used.
- Real and imaginary parts of complex values are marked as 'Re' and 'Im' (or sometimes in old books as '$\mathfrak{Re}$' and '$\mathfrak{Im}$'), not as done by default in TEX where `\Re`=$\Re$ and `\Im`=$\Im$.[1]
- There some standard abbreviations composed from Russian letters. The most typical are:
  - ▹ НОК = Наименьшее Общее Кратное (LCM = Least Common Multiple),
  - ▹ НОД = Наибольший Общий Делитель (GCD = Greatest Common Divisor),
  - ▹ Ш(G) = the Shafarevich / Tate group (marked as 'Ш' even in English publications).

The names of special functions are typically just the same. (This may be due to the fact that at the moment when they were introduced the international communications were much better ☺.)

To be sure, a lot of other function-like notation may be encountered in mathematical literature: rank, rang, Ker, Arg, tr, diag, ... While there is some flexibility (i. e., the author's taste) in such notation, it is worth noting that the differential operation $\vec{\nabla} \times \ldots$ usually marked as 'curl' in English textbooks, is defined as 'rot' in Russian mathematics.

[1] It seems that such notation is not universal in English literature either—for example, in [1] the symbol '$\Im$' is used for *idemfactor* (unity dyadic operator) while real and imaginary parts are defined as 'Re' and 'Im'.

Relations and other symbols: It is typical to use the symbols $\leqslant$ and $\geqslant$, not $\leq$ and $\geq$ for ‘less or equal’ and ‘greater or equal’ binary relations. The empty set is specified as $\varnothing$, not as $\emptyset$ (and the latter is reserved for zero in computer literature). The special symbol ‘$\sqsupset$’ is used sometimes instead of the word “пусть” (let)—in addition to ‘$\forall$’ (“для всех” = ‘for all’) and ‘$\exists$’ (“существует” = ‘there exists’). Quotes used to define minutes ('), seconds ("), thirds (‴) are usually straight, not slanted.

Integrals: Integrals in Russian mathematics are straight—see figure 4 where the two most standard shapes are shown. Although sometimes TEX-style slanted integrals can be seen in Russian textbooks as well, these are the exceptions. Double, triple and circular integrals are shown on figure 5.

Upper and lower limits are always above and below the integral sign centered with respect to its middle. It is permissible to place the limits *near* the ends of the integral sign only when the integral is embedded into the main text, and even this usage of the integral sign is becoming acceptable only recently.

The straight form of the integrals in Russian mathematical books is essential since the integral signs are expanded like other big operators—the size of the big operator is adjusted to the size of the expression to which it is applied (see section “Big fractions, big operators and big delimiters” on page 4 for more details). Slanted integrals look ugly in large sizes, and for this reason straight integrals are used as the standard.

Radicals: The radical sign as usually typed in Russian mathematical literature is shown in figure 6. This graphical shape is reproduced for all sizes of this mathematical sign. It is different from the radicals used in TEX:

$$\sqrt{x}, \qquad \sqrt{\frac{a+b}{c+d}}, \qquad \sqrt{\int f(t)\,dt}, \qquad \sqrt{\frac{\frac{x}{y}+\frac{p}{q}}{\frac{a}{b}+\frac{m}{n}}}$$

When the kernel or the fraction are inside the radical sign, the upper rule of the radical should be longer by ≈ 2 pt as compared with the horizontal rules inside it:

$$\text{in TEX:}\quad \sqrt{\sqrt{x+y}}, \qquad \text{should be:}\quad \sqrt{\sqrt{x+y}}$$

The exception is when the only object inside the radical is the fraction—in this case the length of the radical rule is just the same as for the rule of the fraction:

$$\sqrt[n]{\frac{x^2 - y^2}{x^2 + y^2}}$$

Sums, products, etc.: Big operators—sums $\sum$, products $\prod$, co-products $\coprod$, etc., —are just the same in Russian mathematics as in English.

The essential difference is that in Russian mathematics the size of the big operator is adjusted to the size of the expression to which it is applied—see section “Big fractions, big operators and big delimiters” on page 4 for more details. Upper and lower limits are typically centered above and below big operators even in text mode (by using the TEX command `\limits`), although gradually the tradition to put the limits in text mode to the right side of the operator is also moving into Russian typography (this is really useful because it enables the elimination of non-uniform inter-line spaces).

Other big operator: The following operators are used as well:

- In addition to the ordinary summation $\sum$, the ‘*modulo 2*’ summation $\sum$ may be used.
- It is typical to use the big operator & instead of $\bigwedge$ (i. e., ‘$\&_{i,j} X_{ij}$’, not ‘$\bigwedge_{i,j} X_{ij}$’).

Ellipses: Centered dots ‘$\cdots$’ are used only in multiplication: $x_1 x_2 \cdots x_n$. In all other cases the `\ldots` ellipsis is used. (For example, the sequence of integrals is defined as $\int \ldots \int$ in Russian typography, not as $\int \cdots \int$.) In addition, Russian typography does not use 4-dot ellipses, even in such unintentional cases as ‘!..’, ‘?..’ and ‘:..’. The exception is when the ellipsis is followed by the comma: $x_1, \ldots, x_m$ (note that the preceding comma is separated from the ellipsis by an additional thin space).

Vertical rules: For expressions showing the substitution of some values instead of variables, the typical TEX User uses the big delimiters. By contrast, in Russian typography the vertical line sometimes is not centered but lowered when applied to a single function (especially with multilevel assignments as the subscript):

$$\text{in TEX:} \quad F(x,y)\Big|_{x=a} = \sin y, \qquad \text{should be:} \quad F(x,y)\Big|_{x=a} = \sin y$$

Big fractions, big operators and big delimiters

As is well known, TEX uses four styles in mathematics: *display* (D), *text* (T), *script* (S) and *script-script* (SS). This style defines the size of fractions and mathematical operators, the style for how the upper and lower limits and indices are attached to mathematical operators, the default letter size used in mathematics, etc. The style in formulæ embedded in text starts from T, the style of formulæ placed in a separate block starts with D, and the styles are switched automatically in fractions, integrals, arrays, etc., as it is shown below:

Main style	D	T	S	SS
Numerators and denominators	T	S	SS	SS
Indices	S	S	SS	SS

Contrary to this scheme there are only *three* font scalings associated with four mathematical styles since D-mode and T-mode use letters of the same size. (It is not true for mathematical operators which are greater in D-mode than in T-mode.) Say for the document at 10 pt, D and T correspond to the font at 10 pt, S—to the font at 7 pt, SS—to the font at 5 pt.

In Russian literature there is no difference between the styles of mathematical operators embedded in text and those placed separately.[2] But *four* font sizes are used instead of three: say, for the document at 10 dd these are 10 dd, 8 dd, 6 dd and 4 dd, and for the document at 12dd—12 dd, 10 dd, 8 dd and 6 dd. (Russian typography is based on Didot points—it follows French traditions, not English ones, —and for this reason Russian fonts and spaces are a little bit greater.)

Switching of font sizes in mathematical books is the following:

Main size	10	8	6	4
Numerators and denominators	8	6	4	4
Indices	6	6	4	4

(For newspapers and rapid communications, it is allowed not to decrease the font size for multilevel formulæ at all.)

Suppose there is a fraction typed in *display style*—i. e., when 10 pt is the main font size and 7 pt is the font size for superscripts and subscripts. In TEX the numerator and denominator of this fraction are set in the 10 pt font and their subscripts and superscripts are set at 7 pt as well, but their 'big operators' use

[2] This is not absolutely true. Now the scheme used in TEX is gradually becoming more and more customary—it decreases the parasitic inter-line spaces inserted when a mathematical operator is used in ordinary text and hence improves readability.

the `\textstyle` mode instead of `\displaystyle`. The numerator and denominator of the nested fraction are set at 7 pt with the subscripts and superscripts set at 5 pt, the next level fraction sets both numerator / denominator and their subscripts / superscripts at 5 pt, more levels remain the font sizes unchanged.

In Russian mathematical publications the first level fraction has the numerator and denominator set at 8 pt (8 dd) with subscripts and superscripts still unchanged (i. e., at 6 pt) and with big operators set in `\textstyle` mode. It is essential that for the nested fractions these specifications remain the same irrespective of the nesting level. (That is, switching to *script style* and *scriptscript style* takes place for nested indices, not for nested fractions, square roots, etc.)

As a result, enclosed fractions do not decrease in size so strongly as in TEX and multilevel formulæ are much higher in Russian mathematics. To simulate this effect, enclosed fractions are generally typed in `\displaystyle` which is closer to the original style than that used in TEX.

The consequence of this fact is that in Russian mathematics big operators (sums, products, integrals, radicals) usually have more than just two sizes—it is necessary to adjust the size of the operator and the size of the expression to which it is applied. Normally three different sizes can be used in a book but sometimes four sizes are necessary for 4-level expressions. The size of all operators in one formula should be the same as for the set of radicals when they are in the same line:

$$\sqrt{\frac{a+b}{c+d}} + \sqrt{\int f(t)\,dt} + \sqrt{\frac{\frac{x}{y}+\frac{p}{q}}{\frac{a}{b}+\frac{m}{n}}}$$

(The other rule requires that *all* horizontal lines of the fractions, square roots, etc., placed in the same line should be horizontally aligned, and they should be so for sub-fractions and sub-radicals of the same level for the multilevel expressions.)

In Russian typography big delimiters (especially curly braces) should cover totally the expression to which they are applied. This rule is different from that used in TEX where the delimiters may be a little bit less as compared with the expression (namely, by default the height of the delimiter should be no less than 90% of the expression height, and the delimiter may be shorter than the expression by no more than 5 pt). Since the expressions in Russian mathematics are usually higher than in English literature (as explained above), the standard sizes `\big`, `\Big`, `\bigg` and `\Bigg` as defined in TEX may be too small to cover these demands.

Russian letters in mathematics

In all cases when Cyrillic letters are used in mathematics they should be typed using the upright shape to distinguish them from the Latin letters with a similar shape. There are the following cases where Russian (Cyrillic) letters and symbols could be used in mathematical mode:

Names of mathematical objects: In some cases (this is true for especially economics and engineering books) mathematical variables are designated by Cyrillic (Russian) letters. However, this is almost never done in mathematical literature where such notations are considered '*an impolite behaviour*' (although strictly speaking, the use of Cyrillic letters as mathematical objects is not prohibited explicitly). One reason not to do so is that in many cases Latin letters and Cyrillic letters are quite similar, and it decreases the readability of the document. The other reason is that such notations decrease the mobility of the mathematical results and their understanding by the non-Russian users.

Names of mathematical operators: Despite the above statement, *there are* some typical mathematical notations composed from Cyrillic letters which are used in mathematical literature as the standard abbreviations. Most common are "НОД" = 'GCD', "НОК" = 'LCM' and the Shafarevich / Tate group "Ш(G)" (already mentioned in section "Mathematical notation" on page 1). Such usage of Cyrillic is similar to Gothic and Hebrew notations used in mathematics to define standard mathematical objects.

Indices: Cyrillic letters are used in indices much more frequently than for mathematical objects. It is typical for physics and chemistry where the indices serve as descriptive comments on the objects: $X_{\text{нач.}} = X_{\text{start}}$, $Z_{\text{кон.}} = Z_{\text{final}}$, $T_{\text{плавл.}} = T_{\text{melting}}$, etc. Mathematical documents do not use Cyrillic even in indices except in textbooks for beginners where it may be useful.

Comments, abbreviations, units, etc.: Quite often it is necessary to use Russian text in mathematical mode to comment some formula:

$$f(x) = \begin{cases} 0 & \text{если } x \leqslant 0; \\ x & \text{в противном случае.} \end{cases} \qquad f(x) = \begin{cases} 0 & \text{if } x \leqslant 0; \\ x & \text{otherwise.} \end{cases}$$

Although in formal terms, such text is embedded into the mathematical formula, it is *not* the part of the formula. Hence, it is typed using the standard rules for ordinary text presentation. (In plain-TEX it is inserted inside `\hbox`, for LATEX `\mbox` is recommended.)

Similar to that are the unit abbreviations like *kg*, *cm*, *min*, etc. The former standard required that the unit abbreviations are typed in *italic*. The current standard states that such abbreviations are typed in the same manner as the ordinary text (which in most cases means that they are in an upright roman medium font, but if the main text is emphasized by **bold**, *slanted*, *italic* or sans serif, the unit abbreviation is emphasized similarly). To preserve kerning, such unit abbreviations should also be enclosed in `\hbox` when encountered inside a mathematical formula.

Since nowadays the standards are not so obligatory as formerly, the unit abbreviations may be typed in *italic* even in modern books. Sometimes to emphasize the difference between two systems of notations the Latin abbreviations are typed as upright roman letters ('kg', 'mg', 'mm') while the Russian abbreviations are in italic ('кг', 'мг', 'мм'). In rare cases the scheme is changed: Russian abbreviations are upright while Latin abbreviations are in italic.

Numbering of equations: Like Latin letters, Cyrillic letters can be used to number formulæ: (Б.1), (19-ж), etc. Similar to abbreviations, such usage of Cyrillic letters is *not* actually the usage of Cyrillic in mathematics.

Spaces

The section sign § and the numero sign № are separated from the subsequent numerical value by a space of $\approx 1/2$ font design size. Percentage (%), permille (‰) and similar signs (‱, %₀₀₀₀, ...) are used only with a preceding numerical value, and there is no space between the number and the sign. The symbols of unary mathematical operations are not separated by a space from the subsequent value ($+5^\circ$, $\times 20$). Formulae embedded in text should be separated by a space from that text ($\geqslant$ 0.5 *design size*, $\leqslant$ 1.0 *design size*), and the subsequent formulæ should be separated by a space of $\approx$ *design size*.

The punctuation signs (period, comma, semicolon, ellipsis, exclamation and question signs) are placed immediately after a numerical value as is done with words.[3] Similarly, the ellipsis is attached to a subsequent number or word without spaces (1...2). This is not so when the ellipsis is used to mark skipped elements—in such case the ellipsis is surrounded by thin spaces ≈ 3 pt. When a comma follows an ellipsis, it is placed immediately after the ellipsis and a thin space is added after the comma: $x_1,\ \ldots,\ x_n$. (Compare with the default TEX output: `$x_1,\ldots,x_n$` = $x_1, \ldots, x_n$.)

Degrees (°), minutes ('), seconds ("), thirds (‴) are not separated from the preceding numbers, and there is a space ≈ 2 pt before the next number (10° 15'). (The same is true for charges in chemical formulæ.) If the scale follows such signs (as in 10° C) there is an additional space of ≈ 2 pt, but if there is no numerical value in front of the degree sign, no additional space is inserted (°C).

Long numerical values represented by arabic digits are separated by small spaces to increase their readability keeping 3 digits per group.[4] The size of these spaces should be constant and is ≈ 2 pt (3 245 758 199). Four-digit numbers are not separated by spaces, decimal fractions (0,142857) and numerical indices of the documents (GHOST 123456-789) are also not separated by spaces.

If there is a unit abbreviation after a numerical value, it is separated by a space of $\approx$ 2 pt (1 kg, 10 cm). A text suffix as in '1-ая', '2-ой', '10-ый' ('1st', '2nd' and '10th') is attached by a hyphen without space. For numerical values the integer part and the fraction part are not separated by a space ($2\frac{1}{3}$). Numbers with letters (arabic or roman) do not have additional spaces inside them (3a, IVc), and the composite numbers separated by dots do not have spaces inside them either (1.3.14a).

Numerical subscripts and superscripts do not cause the appearance of additional spaces, especially in chemical formulæ and unit abbreviations (H_2O, m^3/s)—this is opposite to the typical TEX behaviour ($\mathrm{H}_2\mathrm{O}$, $\mathrm{m}^3\,/\,\mathrm{s}$). Footnotes are the exceptions to this rule—a footnote index is separated by a small space ($\approx$ 2 pt) from the preceding word (*something* ^{99}), but there is no additional space if the footnote index is after a period or comma (*something.*^{99}).

Hyphenation in mathematics

Long mathematical formulæ are usually broken into parts. In Russian typography the formula can be broken only at a relational sign ($<$, $>$, $=$, $\approx$, . . ., etc.), at an addition / subtraction sign ($+$, $-$, $\pm$, $\mp$) when it is not a unary operator,

[3] This requirement of the current standard does not follow the historical tradition because in French typography (from which many Russian traditions are borrowed) the punctuation signs are separated by a thin space from the preceding data.

[4] It is the requirement of the standard; in practice the length of the group can be different.

and, finally, at a multiplication sign (that is, at the position where multiplication is assumed since the explicit multiplication sign is usually skipped in mathematical expressions). Relational signs have the greatest priority when the position for formula breaking is selected, then there are the addition / subtraction signs, and the lowest priority is for multiplication. Such signs as $*$, $\cdot$, $/$, $($, $[$, etc., prevents formula breaking. It is not allowed to transfer to the next line just the result of calculation—for example, in '$2 \arcsin \pi x + 2 \arccos \pi x = \pi$' we cannot break the expression at the symbol '$=$'.

When the mathematical formula (embedded in text or as a separated block) is broken into two parts and is continued on the next line, tradition requires that we must repeat the last sign in the broken formula at the end of the first part and at the beginning of the second part placed on the next line. When a multiplication is broken, the explicit multiplication sign '$\times$' is inserted, and this sign is repeated on the next line as well.

Numbers should not be separated by breaks even when the digits are separated by thin spaces to increase readability. (Of course, there are obvious exceptions—nobody can type π or e with 100 digits without unavoidable breaks ☺). Numbers connected by a dash (1985–1999) may be separated by breaks only in newspapers and rapid publications—in such cases the dash is left on the first line. The unit abbreviations like 'kg', 'mg', 'cm', 'pt' should not be transferred to the next line separately from the preceding numerical value. Similarly, the section sign § and numero sign № should not be separated from a subsequent number, and the values in enumerations such as '1. Step one: ...' should be kept together with the subsequent text.

Theorems, lemmas, etc.

Such mathematical statements are usually typed in *italic* when we deal with Russian textbooks, while in English mathematical literature prepared with TEX these statements are sometimes *slanted*. (Slanted type for theorems and the like is a TEX innovation; the traditional English / american style is to use italic [4].)

The headings of mathematical statements contain the dot after the number if the statement is numbered. That is, in Russian we write 'Theorem 1.1. $\langle\ldots\rangle$', not 'Theorem 1.1 $\langle\ldots\rangle$' (a similar style is used for sections, subsections, etc.).

There may be a variety of the theorem-like environments: Аксиома (axiom), Замечание (remark), Лемма (lemma), Определение (definition), Вывод (conclusion), Описание (declaration), Следствие (corollary), Результат (result), Предложение (proposition), Теорема (theorem), Утверждение (statement), Доказательство (proof), Пример (example). Although it is rare that the User includes *all* such constructions in his / her documents, the standard command `\newtheorem` may be not flexible enough to define well-structured styles for these environments. For example, it may be necessary

- to change the default fonts used for the title and for the body,
- to place the counter of the theorem *before* the main title **Theorem**,
- to insert an additional title *between* the main title and the number or *before* the main title,
- to reset the counter of the *corollary* when a new *theorem* starts,
- to include the counter of the theorem into the numbering template of the *example*,
- etc.

TEX and 'Russian mathematics'

Most features described above can be implemented in TEX more or less easily. Specific mathematical symbols (including upright lowercase Greek letters) absent in standard formats can be taken from AMS fonts, or (maybe) from the *New Mathematical Encoding*, or just created in METAFONT from the very beginning. Names of mathematical functions are defined or redefined without any problems as well. The size of delimiters may be adjusted by redefining the parameters `\delimiterfactor` and `\delimitershortfall` (at the same time, it is necessary to redefine the commands `\big`, `\Big`, `\bigg`, `\Bigg`, etc., to specify the set of standard sizes as required for Russian mathematics). Most problems with theorem-like statements can be solved by the package theorem by Frank Mittelbach (maybe after some re-definition of its internal macros).

TEX is powerful enough to solve most problems with proper spacing—for example, the additional space inserted after subscripts and superscripts is specified by the register `\scriptspace` (default value 0.5 pt), and as soon as we set it to 0 pt, the problem with spacing in chemical formulæ like H_2O and units like m^3/s is solved. Nevertheless it may happen that not all spacing rules are reproduced automatically and some explicit manual corrections need to be inserted.

Although, strictly speaking, Russian letters should not be used in mathematics as soon as we consider the *pure* mathematical literature, there are the cases where such usage of Russian letters is useful. So a well-designed Russian style should have an intelligent tool to switch on and off Russian letters in mathematical mode. It seems reasonable that the full set of glyphs is divided into three groups—Russian letters, non-Russian Cyrillic letters[5] and Cyrillic symbols like '№' and '¤'. As a result the user can control the appearance of Cyrillic letters in mathematics—maybe with the warning messages issued on display when an 'illegal' letter / symbol is encountered in mathematics.

There are some problems with big operators. Since the kernel of TEX supports only *two* sizes of operators while we need *several* sizes of them, we can:

- implement big operators as delimiters of a variable size,
- introduce several synonyms—one per size—for each expandable operator.

Although the first method permits the calculation of the size of the operator automatically through using the height of its argument, it may be not the best solution because for sums, integrals, etc., the argument can be split into several lines which prevents TEX from measuring its height. The second method means that the User is totally responsible for the proper size of the operator—which is more robust but less comfortable. As with big delimiters, the implementation of *both* methods may be the optimal solution of the problem.

While there is no problem making straight integrals instead of slanted ones, the radicals reproducing the shape typically used by Russian mathematics may be a problem. The internal command `\radical` is not powerful enough to make the *inclined* expansion of the height of the radical sign. Hopefully, manipulation with boxes as implemented in TEX is powerful enough to *simulate* such expansion—but surely it is not so effective and elegant as the usage of the internal primitive. Proper extension of the horizontal line over the expression inside the radical (it should be a little bit longer) may be the responsibility of the User—all that needs to be done is to add a medium space at the end of the expression inside the radical macro.

Much more complex is to simulate the effect of *four* mathematical fonts necessary for proper representation of fractions—since TEX internally supports only

[5] As can be seen from the encodings T2A / T2B / T2C, there are many letters not used in Russian language but included into other alphabets based on Cyrillic. Although *all* Cyrillic letters should be equal in this respect, the usage of unfamiliar Cyrillic letters can decrease the readability of mathematical text significantly—at least for people who are not familiar with the corresponding language. (By the way, this is the reason not to use Russian letters in mathematics as well—at least in mathematics designed for international usage.) Since for historical reasons many more people are familiar with the Russian alphabet than with other Cyrillic alphabets, it may be useful to mark the Russian letters as a separate group.

three fonts per mathematical family. To some extent it can be simulated by the following 'brute force' macro suggested by M. Grinchuk [9]):

```
\def\vfrac#1#2{%
    \frac{\hbox{\fractionsize $#1$}}%
         {\hbox{\fractionsize $#2$}}%
}
```

Here the command `\fractionsize` sets the desired font size and influences indirectly the font size used in math mode for numerator and denominator (the `\textstyle` mode for numerator and denominator is guaranteed by `\hbox`). The commands like `\Large`, `\small`, `\footnotesize`, etc., should be redefined so that the command `\fractionsize` works properly.

Unfortunately for LaTeX 2_ε `\fractionsize` may also influence the font sizes used for subscripts, superscripts, etc. Fine tuning requires that the control sequence `\fractionsize` resets only the parameter `\textfont` (but for all mathematical families!)—although it seems that the outcome from the proper definition of such an operation does not justify the efforts necessary for its implementation. Just the same case occurs when it is necessary to change the font sizes used for `\scriptfont` and `\scriptscriptfont` for 'russian mathematical style' as it is specified in section "Big fractions, big operators and big delimiters" on page 4.

A similar problem is the hyphenation of broken formulæ. While in display style it is surely the User's responsibility to break formulæ properly, in-line formulæ should be broken automatically. Some ways are already suggested [2, 3, 9] to enable simulated hyphenation of mathematical formulæ with automatic doubling of specific relational or arithmetical symbols. Unfortunately these have the undesirable effect that TeX starts to hyphenate formulæ too often because the suggested scheme is based on changing the standard penalties. Although it is amusing to observe how TeX can do work for which it was not designed originally ☺, it seems that the problem of automatically breaking mathematical formulæ is not solved satisfactorily up to now.

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Α α	Ε ε	Ι ι	Ν ν	Ρ ρ	Φ φ
Β β	Ζ ζ	Κ ϰ	Ξ ξ	Σ σ	Χ χ
Γ γ	Η η	Λ λ	Ο ο	Τ τ	Ψ ψ
Δ δ	Θ ϑ θ	Μ μ	Π π	Υ υ	Ω ω

Figure 1: Standard Greek letters in Russian textbooks

A α	E ϵ ε	I ι	N ν	P ρ ϱ	Φ ϕ φ
B β	Z ζ	K κ	Ξ ξ	Σ σ ς	X χ
Γ γ	H η	Λ λ	O o	T τ	Ψ ψ
Δ δ	Θ θ ϑ	M μ	Π π ϖ	Υ υ	Ω ω

Figure 2: Standard Greek letters in TEX

Main form	Synonyms	Main form	Synonyms
$\sin x$		$\operatorname{sh} x$	$\sinh x$, $\operatorname{Sh} x$, $\mathfrak{Sin}\, x$
$\cos x$		$\operatorname{ch} x$	$\cosh x$, $\operatorname{Ch} x$, $\mathfrak{Cos}\, x$
$\operatorname{tg} x$	$\tan x$	$\operatorname{th} x$	$\tanh x$, $\operatorname{Th} x$, $\mathfrak{Tg}\, x$
$\operatorname{ctg} x$	$\cot x$, $\operatorname{cotg} x$, $\operatorname{ctn} x$	$\operatorname{cth} x$	$\coth x$, $\operatorname{Cth} x$, $\mathfrak{Ctg}\, x$
$\sec x$	$\operatorname{sc} x$	$\operatorname{sech} x$	$\operatorname{sch} x$
$\operatorname{cosec} x$	$\csc x$, $\operatorname{cosc} x$, $\operatorname{csec} x$	$\operatorname{cosech} x$	$\operatorname{csch} x$
$\arcsin x$	$\operatorname{Arcsin} x$, $\sin^{-1} x$	$\operatorname{Arsh} x$	$\operatorname{arsh} x$, $\operatorname{sh}^{-1} x$
$\arccos x$	$\operatorname{Arccos} x$, $\cos^{-1} x$	$\operatorname{Arch} x$	$\operatorname{arch} x$, $\operatorname{ch}^{-1} x$
$\operatorname{arctg} x$	$\operatorname{Arctg} x$, $\operatorname{tg}^{-1} x$	$\operatorname{Arth} x$	$\operatorname{arth} x$, $\operatorname{th}^{-1} x$
$\operatorname{arcctg} x$	$\operatorname{Arcctg} x$, $\operatorname{ctg}^{-1} x$	$\operatorname{Arcth} x$	$\operatorname{arcth} x$, $\operatorname{cth}^{-1} x$
$\operatorname{arcsec} x$	$\operatorname{Arcsec} x$, $\sec^{-1} x$	$\operatorname{Arsech} x$	$\operatorname{arsech} x$, $\operatorname{sech}^{-1} x$
$\operatorname{arccosec} x$	$\operatorname{Arccosec} x$, $\operatorname{arccsc} x$, $\operatorname{cosec}^{-1} x$, $\csc^{-1} x$	$\operatorname{Arcosech} x$	$\operatorname{Arcsch} x$, $\operatorname{arcosech} x$, $\operatorname{arcsch} x$, $\operatorname{cosech}^{-1} x$, $\operatorname{csch}^{-1} x$

Figure 3: Trigonometric functions in Russian textbooks

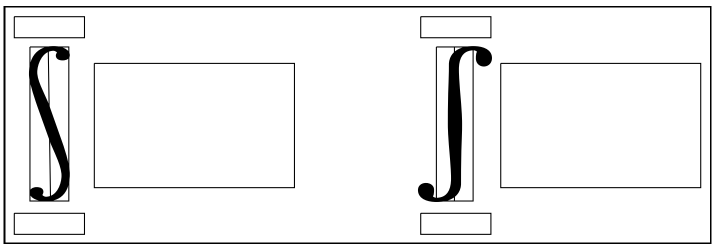

Figure 4: Integrals

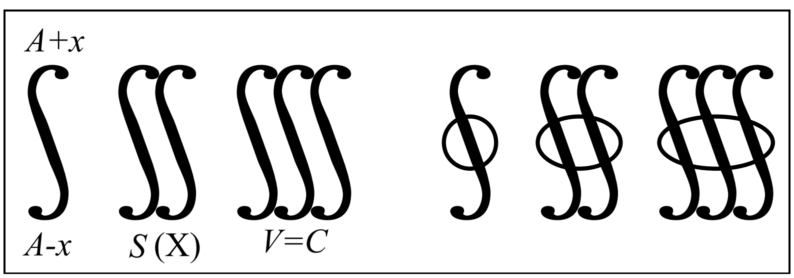

Figure 5: Double and triple integrals

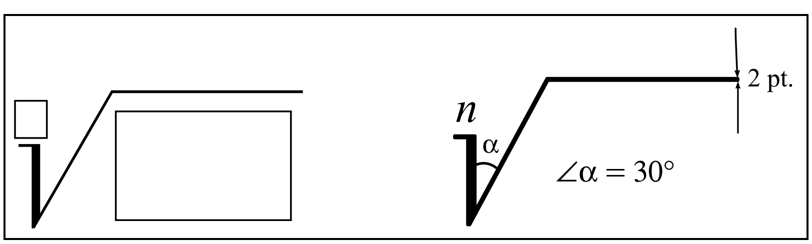

Figure 6: Root symbol