RyDArab

Typesetting Arabic mathematical expressions

Azzeddine Lazrek
University Cadi Ayyad, Faculty of Sciences,
Department of Computer Science,
PO Box 2390, Marrakech, Morocco
Phone: +212 24 43 46 49 Fax: +212 24 43 74 07
lazrek@ucam.ac.ma
http://www.ucam.ac.ma/fssm/rydarab

March 28, 2008

1 Introduction

The **RyDArab** system deals with the problem of typesetting mathematical documents in a *fully Arabic presentation*. This means that not only the text in natural language is Arabic but equations are also composed with special symbols spreading out from right to left according to the natural direction of the Arabic writing. Actually, the system **RyDArab** extends the capabilities of the system TEX and its extensions to allow typesetting such documents.

The **RyDArab** system is an extension of the system of treatment of document TEX. It is based on TEX or LATEX and an Arabic extensions such as ArabTEX, Ω or `Arabi`. It must be integrated in a TEX system with the ArabTEX extension or Ω system or `Arabi`. It uses and modify fonts families `Computer Modern` and the font **RamzArab** by commands of TEX and `METAFONT`. The **RamzArab** package must be called first.

The **RyDArab** system, offer to the user several literal symbol choices, of shape of numbers, of the expandable symbols, ... It wants to be himself most general possible to be used in the different situations and domains of the Arabic scientific document and in the different Arabic regions.

The main qualities of the **RyDArab** system are:

- compatibility:

  - the Arabic and Romance expression cohabit at the same time in a document;
  - the different versions of **RyDArab** are compatible between them;
  - the **RyDArab** system is compatible with the other extensions of TEX;
  - the syntax of commands of **RyDArab** is structurally analogous to the one of commands of TEX.

- the universality:
  - it can be used with any distribution of TEX system;
  - it can be used under the formats `plain` TEX or LATEX. The extension for LATEX requires the standard LATEX2ε;
  - it can be used under the Windows or Linux platform;
  - it can be adapted easily to the other mathematical fonts;
  - it can be adapted easily to needs according to regions, levels, ...

- the simplicity: it is easily usable but from an ASCII transliteration for texts and expressions.

The main hiatuses of the **RyDArab** system are:

- the dependence: it needs the TEX environment;
- the heterogeneity of the symbolic system resulting the import of symbols of various families of characters: the sizes, the level of greasiness, the position of the sign in relation to the line of basis, etc.

The **RyDArab** system is not:

- an autonomous system, it requires to be scratched in a TEX system;
- a system of composition of the Arabic text, it permits to compose the Arabic mathematical expressions;
- a system owner.

TEX is a system of document treatment developed initially by D. E. Knuth of the Stanford university. It is conceived for the exchange and the transmission of text, a real, language of communication, and the formatting, an

excellent capacity of composition, of document. It contains families of fonts `Computer Modern` developed in `METAFONT`. TEX is a set down mark of American Mathematical Society. `METAFONT` is a set down mark of Addison-Wesley Inc. The format `plain` TEX has been developed by D. E. Knuth.

ArabTEX is an extension of TEX conceived by K. Lagally of the Stuttgart university. It permits to generate the Arabic writing, from an ASCII translitteration, of text of different, languages using the Arabic alphabet. It permits to encrust a text in Arabic in a Romance text, and vice versa. It also permits to introduce a Romance mathematical expression in an Arabic text. ArabTEX contains the `xnsh` font developed in `METAFONT`. ArabTEX is protected by copyright and set down under the LPPL (*LATEX Project Public License*) of LATEX3 Project.

Ω is an extension of TEX developed by J. Plaice and Y. Haralambous. It allows generating multilingual texts using the Unicode coding system.

`Arabi` is an Arabic and Farsi scripts package developed by Youssef Jabri, Oujda University. `Arabi` contains the `Al-Mohanad` font.

The LATEX format has been developed initially by L. Lamport. LATEX is protected by a free license that is LPPL (*LATEX Project Public License*) of LATEX3 Project.

Notation: In the following, we will use TEX to mean the motor TEX, when the description is independent of a particular format, that it is `plain` TEX or LATEX.

2 Package

2.1 Files

The package **RyDArab** is distributed as:

`rydarab.zip`: file compressed in `ZIP` format for Windows or Linux platform.

The decompression package gives the following directory tree:

`doc`: the subdirectory of files for documentation composed of:

- `readmera.tex`: this file in `TEX` format for a preliminary description.
- `readmera.pdf`: this file in `PDF` format for a preliminary description.
- `lppl.txt`: license information of the LATEX Project Public License.
- `amexam.tex`: some examples for `plain` TEX and LATEX.
- `amexampl.tex`: `amexam.tex` and some examples for `plain` TEX.

`amexampl.pdf`: some examples for `plain` TEX in `PDF` format.

`amexamla.tex`: `amexam.tex` and some examples in LATEX.

`amexamla.pdf`: some examples for LATEX in `PDF` format.

`amstrupl.tex`: the preamble for a `plain` TEX document.

`amstrula.tex`: the preamble for a LATEX document.

`tabsourceramz.tex`: tables of **RamzArab** symbols.

`fonts/source` subdirectory:

`aminvglyph.mf`: the command for inverting glyph of a `Metafont` font.

`amcmr10.mf`: base file for the font family `amcmr`. It includes `aminvglyph.mf` and `cmr10.mf` files.

`amcmsy10.mf`: base file for the font family `amcmsy`. It includes `aminvglyph.mf` and `cmsy10.mf` files.

`amcmex10.mf`: base file for the font family `amcmex`. It includes `aminvglyph.mf` and `cmex10.mf` files.

`tex/plain` subdirectory for `plain` TEX content the files:

`rydarab.tex`: calls all files for TEX.

`amfontpl.tex`: definition of `amcmsy`, `amcmex` and **RamzArab** fonts families and definition of symbols codes.

`updatepl.tex`: updates and novelties of the last minute, relative to `plain` TEX, that are not integrated of an adequate way in the system.

`tex/latex` subdirectory for LATEX content the files:

`rydarab.sty`: calls all files for LATEX with `NFSS`.

`amcommand.tex`: the definition of all commands.

`amrename.tex`: rename for all commands.

`amfontla.tex`: definition of `amcmsy`, `amcmex` and `amramzrab` fonts families and definition of symbols codes.

`omsamcmsy.df`: definition of `amcmsy` fonts family.

`omxamcmex.df`: definition of `amcmex` fonts family.

`uamramzarab.df`: definition of **RamzArab** fonts family.

`amramzarab.tex`: symbols definition of **RamzArab** fonts family.

`amomsea.tex`: symbols definition of `amomsea` fonts family.

`uamomsea.fd`: definition of `amomsea` fonts family.

`updatela.tex`: updates and novelties of the last minute, relative to LaTeX, that are not integrated of an adequate way in the system.

`transtec.sty`: the transliteration **TransTec** as is adapted for ArabTeX.

`transtec.otp`: the transliteration **TransTec** as is adapted for Ω.

`amarabiwords.tex`: commands with link words in `Arabi`.

`amarabtexwords.tex`: commands with link words in ArabTeX.

Notation: The files, as commands, defined in that system, are prefixed with `am` (for Arabic Mathematical). They will so be distinguished from basics files, as commands, for TeX or for others packages. The `plain` TeX files will be post-fixed with `pl` and LaTeX files will be post-fixed with `la`.

2.2 Installation

The directory tree for a TeX or a LaTeX implementation is described in the `TDS` (TeX Directory Structure).

To install this package, one should add it to the directory tree or create a new directory tree or put it into a folder intended to be the usual one.

3 Versions

3.1 Historic

- 2001/03/18 v1.0: used to compose [4] with LaTeX2ε.
- 2001/05/18 v1.1: used to compose [5]. It includes improvements carried by B. Raichle of the Stuttgart university to assure compatibility with the other articles of Die TeXnische Komödie.
- 2001/09/09 v1.2: the version including:
  - the change of the name of the extension of `arabmath` to `rydarab`;
  - a new transliteration:

    * the change of t, g, G, c and C by T, E, e, C and c respectively;
    * the change of `\amg` by `\ame`.

  - the new definitions, syntactics and semantics for commands, `\amlsum`, `\amlprod`, `\amlim`, `\amsint`, `\amsqrt` and `\amroot` including improvements carried by M. Banouni of the university Ibn Zohr;
  - the new symbols generated by the commands `\amgsum` and `\amgprod`;
  - the numbering of equations and systems of equations;
  - for LaTeX:
    * the utilization of options for the extension;
    * the new definitions for `\amxnsh`;
    * the utilization of the command `\array`;
    * the numbering of equations.

- 2002/03/01 v1.3: the version used to compose the manuscript of the thesis [6]. It includes:
  - the optimization of variables interns;
  - the correction of the mistake in the operator *product*: جذ instead of جد;
  - a new transliteration:
    * the change of s, S, e, E, c and C by c, C, E, e, S and s respectively;
    * the change of `\amc` and `\ams` by `\ams` and `\amc` respectively.
  - the integration of the **CurExt** application, what permits:
    * the utilization of the Arabic font **NasX** developed for the Arabic literal symbols;

    * the new dynamic font utilization developed for the curvilinear delimiters and the kashida of certain expandable conventional symbols;

  - the addition of a space between abbreviations of usual function names;
  - the possibility to use the same names of commands that for the Romance mathematics.
  - the utilization of a new file, `updatepl.tex` for `plain` TEX and `updatela.tex` for LATEX, containing updates and novelties of the last minute that is not integrated of an adequate way in the system.

- 2003/03/03 v1.4: includes:

  - To ensure itself of the call of the ArabTEX package or Ω system. At the time of its absence, the system is blocked;
  - The machine translation (between Arabic, English and French) of the link-words in the mathematical expressions. The extension of the list of the link-words in the mathematical expressions which are in the file `amcomman.tex`. The translation of a link-word which does not appear in the list is marked by مشكلة, PROBLEM or PROBLÈME following the target language.
  - a new transliteration:
    * the change of r by z;
    * the change of `\amr` by `\amz`.
  - the use of the same transliteration used in mathematical expression **TransTec** in text via the **TransTec** package developed by K. Lagally of the Stuttgart university, after our asking;
  - the change of the name of the option `amarabmath` to `arabmath` and `amlatinmath` to `latinmath`;

  - the change of the name of the command `\amlating`, `\amwarabnum`, `\amoldstylenum`, `\amearabnum` to `\lating`, `\warabnum`, `\oldstylenum`, `\earabnum` respectively;
  - transparency of the utilization of the command `\amrl` of inversion of the writing of expressions;
  - the generalization of the possibility to use the same names of commands that for the Romance mathematics;

- 2003/05/07 v1.5: developed with M. Eddahibi of the Cadi Ayyad University and tested only for Lambda in Linux. It includes:
  - the possibility to use the application with the Ω system as with ArabTEX;
  - introduction of the new command `\araby{...}` and the new environnment `\begin{arabyenv} ... \end{arabyenv}` for an Arabic text;
  - adaptation of the font `omsea`;
  - modification of the definition of `cases`, `\surd`;
  - simplification of the name of `\amlatinletter`, `\amlatinpunct` and `\amarabpunct` by `\latinletter`, `\latinpunct` and `\arabpunct` respectively;
  - introduction of the new commands `wpertenthousand`, `epertenthousand`, `\artofr`, `\artoen`, `\artoar`;
  - introduction of the new options `alpwithoutdots`,`alpwithdots`, `funwithdots` and `funwithoutdots`;
  - elimination of the option `oldstylenum` but it stays as a command;
  - improvement of the symbol glyphs of $\overline{\langle}$ and $\overline{\rceil}$.

- 2008/01/08 v1.6: adapted for the `Arabi` system. The call of the **TransTec** transliteration must be located in a environment. This version don't runs with Ω.

- 2008/03/08 v1.7:
  - adapted for the **RamzArab** Arabic mathematical font;
  - break dependence with ArabTEX;

  - the correction of the mistake in the operator *product*: جد instead of جذ;
  - some changes in transliteration;

.

- the future version will include:
  - variable size of the **RamzArab** font;
  - improvement of the options;
  - etc.

3.2 Compatibility

There is not a compatibility between the first versions (1.0, 1.1 and 1.2) of the **RyDArab** extension. There is a compatibility of versions of **RyDArab** from the version 1.2.

The **RyDArab** extension is compatible with all extensions that we had the opportunity to use jointly. It can happen that incompatibilities are generated at the time of the utilization of **RyDArab** together with other extensions.

If the `graphicx` extension is used, then It must be called in first before **RyDArab**.

4 Preamble

To generate some Arabic mathematical expressions with `plain` TEX or LATEX, the user must insert, in the preamble of his/her document, the following commands:
`\input rydarab` when `plain` TEX is used or
`\usepackage[`*options*`]{rydarab}` when LATEX that is in utilization. The list of the options *options*, separated by gamma `,` are described in the following section.

RamzArab extension must be called previously. Evidently, the ArabTEX extension or Ω system or **Arabi** must be called previously also.

5 Options

The following options are offered:

arabmath to begin an environment where is to generate the Arabic mathematical expressions (ex. $\overline{\text{ج}\backslash}$). It is by default the option.

latinmath to begin an environment where is to generate the Romance mathematical expressions (ex. $\sqrt{j}$).

warabnum to generate the Arabian numbers of the Maghreb Arab: ($\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$). it is by default the option.

oldstylenum to generate the Arabian numbers of the Maghreb Arab, old style,: ($\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$).

earabnum to generate the Arabian numbers of the Machrek Arab: ($\{٠, ١, ٢, ٣, ٤, ٥, ٦, ٧, ٨, ٩\}$).

alpwithoutdots for using the alphabetic symbols without dots. This is the default.

alpwithdots for using the alphabetic symbols with dots.

funwithdots for using the abbreviation representing elementary functions with dots. This is the default.

funwithoutdots for using the abbreviation representing elementary functions without dots.

These options can be specified in the preamble of the document when they are called has be applicable to all the document or then in the beginning of an expression, in mathematical fashion, the effect of the option ends in end of termination of this expression.

These options can be specified under shape of command, that is: *option* or again under shape of option of the `rydarab` extension in LaTeX, that is: `\usepackage[`*option*`]{rydarab}`

6 Commands

The machine translation (between Arabic, English and French) of the linkwords in the mathematical expressions:

- `\artoar`: for an Arabic link-words;
- `\artoen`: for a link-words translation from Arabic to English;
- `\artofr`: for a link-words translation from Arabic to French.

The RyDArab system can translate mathematical expressions and link-words from Arabic to French or English and conversely. The user can get different results from the following mathematical expression `\expression` depending on the environment, easily specified:

```
$$d(c) = {\cases{
 {{\ssum\limits_{b={1}}^{s}} c{{}^b}} &
 {{\amhbox{AZa kan}} {\ } c < 0} \cr
 {{\sint\limits_{1}^{s}} c{{}^b} D c} &
 {{\amhbox{AZa kan}} {\ } c > 0} \cr
 {{\sin} \pi} & {{\amhbox{Gyr Zlk}}} \cr
 }}$$
```

Case 1: `\arabmath \artoar \expression`

ادرس التابعة التالية :

$$د(ش) = \begin{cases} \sum_{ب=1}^{ص} ش_{ب} & \text{اذا كان } ش > 0 \\ \int_{1}^{ص} ش_{ب} ش & \text{اذا كان } ش < 0 \\ \text{جا } \pi & \text{غير ذلك} \end{cases}$$

Figure 1: Arabic presentation

Case 2: `\latinmath \artoar \expression`

أُدْرُسْ آلْدَّالَّةْ آلْتَّالِيَةْ :

$$d(c) = \begin{cases} \sum_{b=1}^{s} c^b & \text{اذا كان } c < 0 \\ \int_{1}^{s} c^b Dc & \text{اذا كان } c > 0 \\ \sin\pi & \text{غير ذلك} \end{cases}$$

Figure 2: Mixed presentation

Case 3: `\latinmath \artofr \expression`

Étudier la fonction suivante :

$$d(c) = \begin{cases} \sum_{b=1}^{s} c^b & \text{si } c < 0 \\ \int_{1}^{s} c^b Dc & \text{si } c > 0 \\ \sin\pi & \text{sinon} \end{cases}$$

Figure 3: French presentation

Case 4: `\latinmath \artoen \expression`

Study the following function:

$$d(c) = \begin{cases} \sum_{b=1}^{s} c^b & \text{if } c < 0 \\ \int_{1}^{s} c^b Dc & \text{if } c > 0 \\ \sin\pi & \text{otherwise} \end{cases}$$

Figure 4: English presentation

The system **RyDArab** provides various Arabic characters without dots nor vowels nor diacritic with three shapes of Arabic characters (initial, isolated and with a tail) in bold or contour forms.

There are Arabic literal symbols via the transliteration **TransTec** from an adaptation of the font **RamzArab** (Cf. Table 1).

There are Arabic literal symbols from the font **RamzArab**. (Cf. Table 2) (Cf. Table 3) (Cf. Table 4) (Cf. Table 5) (Cf. Table 6) (Cf. Table 7)(Cf. Table 8)

The names used for Arabic alphabetic letters are those adopted by Unicode Standard.

```
$\isolated{b}$
```

ب

or

```
\arabmath $b$
```

ب

```
${\isolated{b}} , {\initial{b}} , {\tailed{b}} ,
 {\stretched{b}} , {\looped{b}} ,
 {\doublestruck{b}} , {\initialdoublestruck{b}}$
```

ب ، بـ ، بـه ، با ، بـه ، پ ، پـ

or

```
$\beh , {\initial{\beh}} , {\tailed{\beh}} ,
 {\stretched{\beh}} , {\looped{\beh}} ,
 {\doublestruck{\beh}} , {\initialdoublestruck{\beh}}$
```

ب ، بـ ، بـه ، با ، بـه ، پ ، پـ

or

```
$\beh , \Beh , \behh , \beha ,
 \BEH , \bbeh , \BBeh$
${\isolated{abjd}} , {\initial{owzh}} , {\tailed{Tykl}} ,
 {\stretched{mnWe}} , {\looped{fsqr}} ,
 {\doublestruck{ctFx}} , {\initialdoublestruck{pPvg}}$
```

ب ، بـ ، بـه ، با ، بـه ، پ ، پـ

اب ج د ، هـ ح ، طـ یـه کـه لـه ، مانلساعا ، فـ ه ص ق ر ، ش ت ث خ ، ض ظ غ

Diacritic marks and accents, in various shapes, can be combined to one or several symbols. Diacritic marks can be placed beside the symbol in the left. Some of these diacritic marks are variable-sized:

```
$a{{'}} , b{{'}} , j{{'}} , \cdots$
```

ا′ ، ب′ ، ج′ ، ⋯

or

```
$a{{}^{\prime}} , b{{}^{\prime}} ,
 j{{}^{\prime}} , \cdots$
$b{{'}} , b{{'}{'}} , b{{'}{'}{'}} , \cdots$
```

ا′ ، ب′ ، ج′ ، ⋯

ب′ ، ب″ ، ب‴ ، ⋯

or

```
$b{{}^{\prime}} , b{{}^{\prime\prime}} ,
 b{{}^{\prime\prime\prime}} , \cdots$
${\hat b} , {\check b} , {\tilde b} , {\acute b} , {\grave b} ,
 {\dot b} , {\ddot b} , {\breve b} ,
 {\bar b} , {\vec b},{\overleftarrow{b}},{\overrightarrow{b}}$
```

ب′ ، ب″ ، ب‴ ، ⋯

```
$\underline{abj} , \overline{abj} , \widehat{abj} ,
 \widetilde{abj} , \overleftarrow{abj} ,
 \overrightarrow{abj},\overbrace{abj},\underbrace{abj}$
```

Abbreviations of usual functions are offered according to their common use in mathematical handbooks (Cf. Table 9).

Generally, the abbreviations representing elementary functions are used with dots. Sometimes, they are noted without dots.

```
 $\sin c + \tan s$
```

```
\funwithdots\arabmath
 $\sin c + \tan s$
```

```
\funwithoutdots
```

Eastern or western Arabic numbers are chosen according to the author specifications:

```
\warabnum
$0 , 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9$
\earabnum
$0 , 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9$
$ {\oldstylenum{0 , 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9}}$
```

Both Arabic and Roman dotting are available:

```
\latinmath$ , . ; : ! ? - \cdots$
```

and

```
\arabmath$ , . ; : ! ? - \cdots$
$\lating$
```

Variable-sized delimiters with automatic adjusting:

```
$\langle , ( , | , [ , || , \{ , \cdots
 \} , || , ] , | , ) , \rangle$
```

Some usual symbols such as:

```
$+ , - , * , \times , = , \cdots$
$\amtimes$
$/ , \% ,
\wpermille , \wpertenthousand ,
\epercent , \epermille ,
\epertenthousand , \cdots$
$< , > ; \in , \ni ;
 \seqm , \leqm , \leqv ; \cdots$
```

```
$\surd ; \angle ; \exists , \forall ; \cdots$
```

Negation:

```
${\not=} , {\not<} , {\not\in} , \cdots$
```

Mathematical Arabic symbols that stretch or shrink according to the context:

- square:

```
${\sqrt{{{ {b*9} \over {lc} }}}} -
 {\sqrt{c{{}\sp 2}}} + {\sqrt{5a}}$
```

```
${\root{3b} \of {2+{\frac{b*9}{c}}}}$
```

- integral:

```
${\lint\limits_{1}^{T}} c{{}^{b}} D c$
```

```
${\sint\limits_{1}^{T}} c{{}^{b}} D c
 {\sint_{1}^{T}} c{{}^{b}} D c$
```

- sum:

```
${\csum_{b=1}^{s}} c{{}^b} ;
 {\csum_{b=a-1}^{s}} c{{}^b}$
```

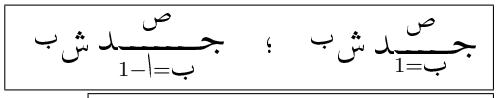
```
\funwithoutdots
${\csum_{b=1}^{s}} c{{}^b} ;
 {\csum_{b=a-1}^{s}} c{{}^b}$
\funwithdots
${\lsum_{b=1}^{s}} c{{}^b} ;
 {\lsum_{b=a-1}^{s}} c{{}^b}$
\funwithoutdots
${\lsum_{b=1}^{s}} c{{}^b} ;
 {\lsum_{b=a-1}^{s}} c{{}^b}$
\funwithdots
${\ssum_{b=1}^{s}} c{{}^b} ;
 {\ssum\limits_{b=a-1}^{s}} c{{}^b}$
```

```
${\gsum_{b=1}^{s}} c{{}^b} ;
 {\gsum_{b=a-1}^s} c{{}^b}$
```

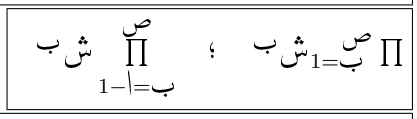
- product:

```
${\cprod_{b=1}^{s}} c{{}^b} ;
 {\cprod_{b=a-1}^{s}} c{{}^b}$
```

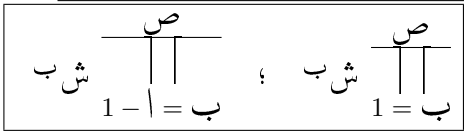
```
${\lprod_{b=1}^{s}} c{{}^b} ;
 {\lprod_{b=a-1}^{s}} c{{}^b}$
```



```
${\sprod_{b=1}^{s}} c{{}^b} ;
 {\sprod\limits_{b=a-1}^{s}} c{{}^b}$
```

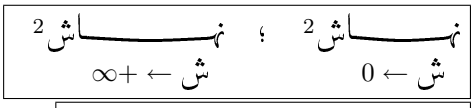


```
${\gprod_{b=1}^{s}} c{{}^b} ;
 {\gprod_{b=a-1}^s} c{{}^b}$
```

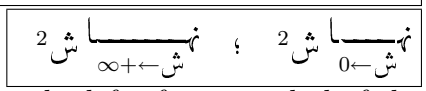


- limit:

```
${\clim_{c \to 0}} c{{}^2} ;
 {\clim_{c \to +\infty}} c{{}^2}$
```



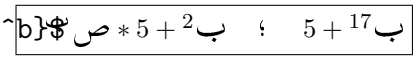
```
${\lim_{c \to 0}} c{{}^2} ;
 {\lim_{c \to +\infty}} c{{}^2}$
```



Subscripts or superscripts can be placed at the left of any symbol of the equation:

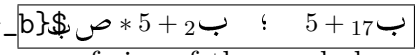
- superscript:

```
$b{{}\sp{{17}}}+5 ; b{{}\sp{2}}+5*s{{}^b}$
```



- subscript:

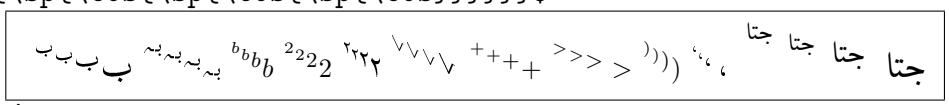
```
$b{{}\sb{{17}}}+5 ; b{{}\sb{2}}+5*s{{}_b}$
```



The system manage automatically the change of size of the symbol according to its position (normal, subscript or superscript, etc.):

- superscript:

```
$b{\sp{b{\sp{b{\sp{b}}}}}}$
$\behh{\sp{\behh{\sp{\behh{\sp{\behh}}}}}}$
{\latinletter $b{\sp{b{\sp{b{\sp{b}}}}}}$}
$2{\sp{2{\sp{2{\sp{2}}}}}}$
{\earabnum $2{\sp{2{\sp{2{\sp{2}}}}}}$}
$\surd{\sp{\surd{\sp{\surd{\sp{\surd}}}}}}$
$+{\sp{+{\sp{+{\sp{+}}}}}}$ $<{\sp{<{\sp{<{\sp{<}}}}}}$
$({\sp{({\sp{({\sp{(}}}}}}$ $,{\sp{ ,{\sp{ ,{\sp{ ,}}}}}}$
$\cos{\sp{\cos{\sp{\cos{\sp{\cos}}}}}}$
```



- subscript:

```
$b{\sb{b{\sb{b{\sb{b}}}}}}$
$\behh{\sb{\behh{\sb{\behh{\sb{\behh}}}}}}$
{\latinletter $b{\sb{b{\sb{b{\sb{b}}}}}}$}
$2{\sb{2{\sb{2{\sb{2}}}}}}$
{\earabnum$2{\sb{2{\sb{2{\sb{2}}}}}}$}
$\surd{\sb{\surd{\sb{\surd{\sb{\surd}}}}}}$
$+{\sb{+{\sb{+{\sb{+}}}}}}$ $<{\sb{<{\sb{<{\sb{<}}}}}}$
$({\sb{({\sb{({\sb{(}}}}}}$ $,{\sb{ ,{\sb{ ,{\sb{ ,}}}}}}$
$\cos{\sb{\cos{\sb{\cos{\sb{\cos}}}}}}$
```

جتا جتا جتا جتا ، ، ، ، ((((>>>> ++++ √√√√ ٢٢٢٢ 2222 bbbb ببب ب

New usual functions can also be defined:

```
${\newfunc{SGr}}(c) =
 \cos(c{{}\sp 2}) + \sin(c)-6$
```

صغر (ش) = جتا (ش^2) + جا (ش) − 6

Functions defined by cases can be typeset from right to left:

```
$d(c) = {\cases{
 {-4c} & {{\hbox{ \araby{AZa kan}}} c<0}\cr
 { 4c} & {{\hbox{ \araby{AZa kan}}} c>0}\cr
 {-2} & {{\hbox{ \araby{Gyr Zlk}}} }\cr
 }}$
```

د(ش) = {
−4ش اذا كان ش < 0
4ش اذا كان ش > 0
−2 غير ذلك

Equations and systems of equations can be numbered or labelled at the right or the left:

```
$7c + 5 = 0 (1)$
```

7ش + 5 = 0   (1)

```
$(2) 7c + 5 = 0$
```

(2)   7ش + 5 = 0

```
$$2c{{}\sp 2} - 3c + 5 = 0 \leqno (3a)$$
```

(3ا)   2ش^2 − 3ش + 5 = 0

```
$$2mc{{}^2} - 3c + 5 = 0 \eqno (3b)$$
```

2مش^2 − 3ش + 5 = 0   (3ب)

Systems of equations:

```
$${\system{
 {5c - 4s + 6} & { = 8s} \cr
 {5c - 7s + 9} & { = 3} \cr
 {5c - 7s + 9T} & { = {12}c} \cr }} \eqno (1a)$$
```

$$\left.\begin{aligned} 8ص &= 6 + 4ص - 5ش \\ 3 &= 9 + 7ص - 5ش \\ 12ش &= 9ط + 7ص - 5ش \end{aligned}\right\} \qquad (1ا)$$

```
$${\left\{}
{\offinterlineskip \openup1\jot \tabskip=0pt plus1fil
\vcenter{\halign{\tabskip=0pt & \hfil$#${\ }& \hfil$#${\ }\cr
\amrl{&{3c}&+&{5s}&&& =&8}\cr \amrl{&&-&{6s}&-&{4m}& =&9}\cr
\amrl{-&{5c}&&&+&{6m}& =&2}\cr}}} {\right.}\leqno (1b)$$
```

$$\left.\begin{aligned} 8 &= 3ش + 5ص \\ 9 &= 4م - 6ص - \\ 2 &= 6م + 5ش - \end{aligned}\right\} \qquad (1ب)$$

Matrices can be composed with Arabic symbols:

```
$ m = {\left() {\matrix{
 {1}&{2s}&{3}&{+5}\cr
 {4a}&{5}&{6}&{-2}\cr
 {4a}&{5}&{6}&{-2}\cr}} {\right)}$
```

$$\begin{pmatrix} 1 & 2ص & 3 & 5+ \\ \lvert 4 & 5 & 6 & 2- \\ \lvert 4 & 5 & 6 & 2- \end{pmatrix} = م$$

Composition of tables with the possibility of combining lines and columns:

```
$${{{{\vbox{\tabskip=0pt \offinterlineskip
\def\tablerule{\noalign{\hrule}}
\halign{\strut#&\vrule#\tabskip=1.5em plus 2.5em&\hfil#&
\vrule#&\hfil#\hfil&\vrule#&\hfil#&\vrule#\tabskip=0pt\cr\tablerule
\amrl{&{\multispan5\hfil{\hbox{\araby{almbyan}}}\hfil}&&}\cr\tablerule
\amrl{&&&&{\omit\hidewidth{\hbox{\araby{alAHdaFyat}}}\hidewidth}&&&}\cr
\amrl{&{\raisebox{2ex}[0cm]{\hbox{\araby{alnqT}}}}&&{\omit\hidewidth
{\hbox{\araby{alsynyQ}}}\hidewidth}&&{\omit\hidewidth
{\hbox{\araby{alSadyQ}}}\hidewidth}&&}\cr\tablerule
\amrl{&$a$&&$5$&&$7$&&}\cr\tablerule
\amrl{&$b$&&$8$&&$9$&&}\cr\tablerule \noalign{\smallskip} }}}}}$$
```

المبيان		
النقط	الاحداثيات	
	السينية	الصادية
ا	5	7
ب	8	9

It allows also the use of calendars with "eastern" or "western" or "Libyan" Arabic names for the months:

```
${\warabnum\numtoday}
 {\earabnum\numtoday}
 {\warabnum\wtoday}
 {\warabnum\ltoday}
 {\earabnum\etoday}$
```

	٢٨ آذار ٢٠٠٨ 28 الربيع 2008 28 مارس 2008 ٢٠٠٨/٣/٢٨ 2008/3/28
`$\lem$`	كانون الثاني، شباط، آذار، نيسان، ايار، حزيران، تموز، آب، ايلول، تشرين الاول، تشرين الثاني، كانون الاول
`$\lwm$`	يناير، فبراير، مارس، ابريل، ماي، يونيه، يوليوز، غشت، شتنبر، اكتوبر، نونبر، دجنبر
`$\llm$`	اي النار، النور، الربيع، الطير، الماء، الصيف، ناصر، هانيبال، الفاتح، التمور، الحرث، الكانون

Notation: Definite command names in this system are prefixed by `am` (the initial of `arabic mathematical`). Therefore, they will be distinct of commands of basis of TEX or those of the other extensions. Names of commands drift the corresponding commands of TEX.

Notes:

- One should not put mathematical expressions in display mode for the interior of an Arabic environment.
- Any expression which requires arguments must be between accolades (eg. `{\fonct{arg_1}...{arg_n}}`).
- If an expression is made up of only one element with at least an argument, it should be preceded by a space (eg. `$␣{element}$`).

7 Documentation

In [1], we have present the importance of studying mathematical in Arabic. In [2], we have present the mathematical Arabic language. In [5], we have present syntactic commands used in this system. In [4], we have present the mathematical Arabic font problematical. In [6], we have give a large presentation for this system and a manual of utilization. In [8], we have discuses the learning and pedagogic problem. In [3], we have present a study

for transliteration and the new transliteration **TransTec**. In [7], we have present the application **CurExt**. In [9], we'll give a short presentation for this system.

8 Copyright

RyDArab is copyrighted. The system and its source program's are in the public domain. That will encourage its use in one hand, and in the other hand, it allow its extension and improvement. The system is copyright only in order to forbid unauthorized copies.

However, you may use it freely for any scientific, experimental and strictly personal, non-commercial purposes if you give proper credit to the author. All other uses require a separate written license from the author.

This program may be distributed and/or modified under the conditions of the LaTeX Project Public License, either version 1.2 of this license or any later version.

The latest version of this license is in:

`http://www.latex-project.org/lppl.txt`

and version 1.2 or later is part of all distributions of LaTeX version 1999/12/01 or later.

This program consists of all files listed in this file `readmera.tex`.

The **RyDArab** project is far from finished. It supposed to change without prior notice.

Do not, however, mistake **RyDArab** itself for a TeX system! This document is only a brief introduction to the new possibilities and is intended for package writers who are familiar with TeX fonts and TeX or LaTeX packages and ArabTeX. It is neither a user-guide nor a reference manual for TeX or LaTeX.

9 Acknowledgements

First and foremost I want to thank Khalid Sami who had the first idea for the package development and for redaction. I also want to thank Mostafa Banouni, Klaus Lagally and Bernd Raichle for there assistance and contribution. Thanks to Abdelaziz NasroAllah and Mohammed Laghchim-Lahlou who maintained it during the beginning of its developments. Thanks for Mustapha Eddahibi and Mohamed Elyaakoubi for their aid. Finally, thank you very much for all users who have transmit me their remarks, suggestions, and mistakes.

The possibilities are almost unlimited, take your time and explore them! If you encounter any problem or inquiries please contact me. Please send error reports and suggestions for improvement to the author.

10 Author

Address: Azzeddine Lazrek
University Cadi Ayyad, Faculty of Sciences,
Department of Computer Science, PO Box 2390, Marrakech, Morocco
Phone: +212 24 43 46 49
Fax: +212 24 43 74 07
lazrek@ucam.ac.ma
http://www.ucam.ac.ma/fssm/rydarab

CV author: Ph.D. in Computer Science 1988, Work on Processing multilingual scientific documents, Professor of Computer Science since 1989 in University Cadi Ayyad, Marrakech, Morocco.

References

[1] عزالدين لزرق وخالد سامي، آفاق معالجة النصوص الرياضياتية باللغة العربية، ماوتمر المعلوماتية والصناعة البرمجية ودورها المستقبلي، اتحاد مجالس البحث العلمي العربية وكلية الحدبالا الجامعة، الموصل، العراق، 2000

(Azzeddine Lazrek and Khalid Sami, *Arabic mathematical document processing perspectives*, Symposium on Computer science and software development and its future impact, Federation of Arab scientific research councils and University AlHadbaA Faculty, Iraq, 2000).

[2] عزالدين لزرق وخالد سامي، نظام مبتكر لمعالجة النصوص الرياضياتية العربية، الماوتمر السابع لتعريب العلوم، تعريب العلوم في منظومة التنمية القومية، الجمعية المصرية لتعريب العلوم وجامعة عين شمس، القاهرة، مصر، 2001

(Azzeddine Lazrek and Khalid Sami, *Towards a system for Arabic mathematical document processing*, 7th symposium of Sciences Arabization, Sciences Arabization in development system, Egyptian Society for Arabizing Science and Ayn shams University, Egypt, 2001).

[3] Mostafa Banouni, Azzeddine Lazrek et Khalid Sami, *Une translittération arabe/roman pour un e-document*, 5e Colloque International sur le Document Électronique (Conférence Fédérative sur le Document, Hammamet, Tunisi), 2002, pp. 123–137.

[4] Azzeddine Lazrek, *Aspects de la problématique de la confection d'une fonte pour les mathématiques arabes*, Cahiers GUTenberg, vol. 39–40, Le document au XXIe siècle, 2001, pp. 51–62.

[5] ———, *A package for typesetting arabic mathematical formulas*, Die TEXnische Komödie, DANTE e.V., vol. 13. (2/2001), 2001, pp. 54–66.

[6] ———, *Vers un système de traitement du document scientifiquu arabe*, Thèse d'État ès-Science, Université Cadi Ayyad, Marrakech, 2002.

[7] ———, *Curext, typesetting variable-sized curved symbols*, EuroTEX (Brest, France), 2003, pp. 47–71.

[8] Azzeddine Lazrek and Khalid Sami, *Arabic mathematical documents, typesetting for a better learning*, International Symposium on Innovation in Information & Communication Technology (Amman, Jordan), 2002, pp. 165–180.

[9] ———, *Rydarab, typesetting mathematics in an arabic presentation*, Submitted (2003).

Letter	Name	Text	Mathematical expression			
ا	alef	a	ا	a	ﺍ	A
ب	beh	b	ب	b	ﺏ	B
ج	jeem	j	ج	j	ﺟ	J
د	dal	d	د	d	،	D
ه	heh	h	ه	o	ﻫ	O
و	waw	w	و	w		
ز	zain	z	ز	z	ﺯ	Z
ح	hah	H	ح	h	ﺣ	H
ط	tah	T	ط	T		
ي	yeh	y	ي	y	ﻳ	Y
ك	kaf	k	ك	k	ﻛ	K
ل	lam	l	ل	l	ﻟ	L
م	meem	m	م	m	ﻣ	M
ن	noon	n	ن	n	ﻧ	N
س	seen	s	س	W		
ع	ain	E	ع	e	ﻋ	E
ف	feh	f	ف	f		
ص	sad	S	ص	s	ﺻ	S
ق	qaf	q	ق	q	ﻗ	Q
ر	reh	r	ر	r	ﺭ	R
ش	sheen	C	ش	c	ﺷ	C
ت	teh	t	ت	t		
ث	theh	F	ث	F		
خ	khah	X	خ	x	ﺧ	X
ذ	thal	Z	ذ	p		
ض	dad	D	ض	P		
ظ	zah	V	ظ	v	ﻇ	V
غ	ghain	G	غ	g	ﻏ	G
ى	alef maksura	Y	ى	i	ﻯ	I
ء	hamza on line	A- or -M	ء	u		
لا	lamalef	la	لا	U		
ـ	kashida	K *or* -				
ة	teh marbuta	Q				
آ	fatha	e				
آ	damma	u				
آ	kasra	i				
آ	fathatan	eN *or* ee				
آ	dammatan	uN *or* uu				
آ	kasratan	iN *or* ii				
آ	shadda	W				
آ	sukun	o				
آ	hamza on alef	Aa				
إ	hamza under alef	AY				
ؤ	hamza on waw	Aw				
ئ	hamza on yeh	Ay				
آ	madda on alef	Ma				
آ	wasla on alef	L				

Table 1: **TransTec** transliteration

ISOLATED		\initial	\tailed	\stretched	\looped	\doublestruck	\initialdoublestruck
a	ا				ا	ا	
b	ب	بـ	بـه	بـا	بـه	ب	بـ
j	ج	جـ	جـه	جـا	جـه	ج	جـ
d	د				د	د	
o	ه	هـ	هـه	هـا	هـه	ه	هـ
w	و				و	و	
z	ز				ز	ز	
h	ح	حـ	حـه	حـا	حـه	ح	حـ
T	ط	طـ	طـه	طـا	طـه	ط	طـ
y	ي	يـ	يـه	يـا	يـه	ي	يـ
k	ك	كـ	كـه	كـا	كـه	ك	كـ
l	ل	لـ	لـه		لـه	ل	لـ
m	م	مـ	مـه	مـا	مـه	م	مـ
n	ن	نـ	نـه	نـا	نـه	ن	نـ
W	س	سـ	سـه	سـا	سـه	س	سـ
e	ع	عـ	عـه	عـا	عـه	ع	عـ
f	ف	فـ	فـه	فـا	فـه	ف	فـ
s	ص	صـ	صـه	صـا	صـه	ص	صـ
q	ق	قـ	قـه	قـا	قـه	ق	قـ
r	ر				ر	ر	
c	ش	شـ	شـه	شـا	شـه	ش	شـ
t	ت	تـ	تـه	تـا	تـه	ت	تـ
F	ث	ثـ	ثـه	ثـا	ثـه	ث	ثـ
x	خ	خـ	خـه	خـا	خـه	خ	خـ
p	ذ				ذ	ذ	
P	ض	ضـ	ضـه	ضـا	ضـه	ض	ضـ
v	ظ	ظـ	ظـه	ظـا	ظـه	ظ	ظـ
g	غ	غـ	غـه	غـا	غـه	غ	غـ

Table 2: Mathematical basic alphabetic symbols

Symbol	\isolated	\initial	\tailed	\stretched	\looped	\doublestruck	\initialdoublestruck
a	ا				ﻁ	ا	
b	ب	بـ	ـبـ	بـا	ﺑ	ب	بـ
j	ج	جـ	ـجـ	جـا	ﺠ	ج	جـ
d	د				ﺩ	د	
o	ه	هـ	ـهـ	هـا	ﻫ	ه	هـ
w	و				ﻭ	و	
z	ز				ﺯ	ز	
h	ح	حـ	ـحـ	حـا	ﺤ	ح	حـ
T	ط	ط	ـطـ	طـا	ﻄ	ط	طـ
y	ي	يـ	ـيـ	يـا	ﻴ	ي	يـ
k	ك	كـ	ـكـ	كـا	ﻜ	ك	كـ
l	ل	لـ	ـلـ		ﻠ	ل	لـ
m	م	مـ	ـمـ	مـا	ﻤ	م	مـ
n	ن	نـ	ـنـ	نـا	ﻨ	ن	نـ
W	س	سـ	ـسـ	سـا	ﺴ	س	سـ
e	ع	عـ	ـعـ	عـا	ﻌ	ع	عـ
f	ف	فـ	ـفـ	فـا	ﻔ	ف	فـ
s	ص	صـ	ـصـ	صـا	ﺼ	ص	صـ
q	ق	قـ	ـقـ	قـا	ﻘ	ق	قـ
r	ر				ﺭ	ر	
c	ش	شـ	ـشـ	شـا	ﺸ	ش	شـ
t	ت	تـ	ـتـ	تـا	ﺘ	ت	تـ
F	ث	ثـ	ـثـ	ثـا	ﺜ	ث	ثـ
x	خ	خـ	ـخـ	خـا	ﺨ	خ	خـ
p	ذ				ﺫ	ذ	
P	ض	ضـ	ـضـ	ضـا	ﻀ	ض	ضـ
v	ظ	ظـ	ـظـ	ظـا	ﻈ	ظ	ظـ
g	غ	غـ	ـغـ	غـا	ﻐ	غ	غـ

Table 3: Mathematical basic alphabetic symbols

ISOLATED		\initial	\tailed	\stretched	\looped	\doublestruck	\initialdoublestruck
\alefA	ا				ا	ا	
\beh	ب	بـ	بـه	بـا	بـه	ب	بـ
\jeemA	ج	جـ	جـه	جـا	جـه	ج	جـ
\dalA	د				د	د	
\heh	ه	هـ	هـه	هـا	هـه	ه	هـ
\wawA	و				و	و	
\zain	ز				ز	ز	
\hah	ح	حـ	حـه	حـا	حـه	ح	حـ
\tah	ط	طـ	طـه	طـا	طـه	ط	طـ
\yeh	ي	يـ	يـه	يـا	يـه	ي	يـ
\kafA	ك	كـ	كـه	كـا	كـه	ك	كـ
\lamA	ل	لـ	لـه		لـه	ل	لـ
\meemA	م	مـ	مـه	مـا	مـه	م	مـ
\noon	ن	نـ	نـه	نـا	نـه	ن	نـ
\seenA	س	سـ	سـه	سـا	سـه	س	سـ
\ain	ع	عـ	عـه	عـا	عـه	ع	عـ
\feh	ف	فـ	فـه	فـا	فـه	ف	فـ
\sadA	ص	صـ	صـه	صـا	صـه	ص	صـ
\qafA	ق	قـ	قـه	قـا	قـه	ق	قـ
\reh	ر				ر	ر	
\sheenA	ش	شـ	شـه	شـا	شـه	ش	شـ
\teh	ت	تـ	تـه	تـا	تـه	ت	تـ
\theh	ث	ثـ	ثـه	ثـا	ثـه	ث	ثـ
\khah	خ	خـ	خـه	خـا	خـه	خ	خـ
\thal	ذ				ذ	ذ	
\dadA	ض	ضـ	ضـه	ضـا	ضـه	ض	ضـ
\zah	ظ	ظـ	ظـه	ظـا	ظـه	ظ	ظـ
\ghain	غ	غـ	غـه	غـا	غـه	غ	غـ

Table 4: Mathematical basic alphabetic symbols

ISOLATED		INITIAL		TAILED		STRETCHED		LOOPED		ISOLATED DOUBLE-STRUCK		INITIAL DOUBLE-STRUCK	
\alefA	ا							\ALEF	ﺍ	\aalef	𝕒		
\beh	ب	\Beh	ﺑ	\behh	ﺒ	\beha	ﺒﺎ	\BEH	ﺐ	\bbeh	𝕓	\BBeh	𝔹
\jeemA	ج	\Jeem	ﺟ	\jeemh	ﺠ	\jeema	ﺠﺎ	\JEEM	ﺞ	\jjeem	𝕛	\JJeem	𝕁
\dalA	د							\DAL	ﺩ	\ddal	𝕕		
\heh	ه	\Heh	ﻫ	\hehh	ﻬ	\heha	ﻬﺎ	\HEH	ﻪ	\hheh	𝕙	\HHeh	ℍ
\wawA	و							\WAW	ﻭ	\wwaw	𝕨		
\zain	ز							\ZAIN	ﺯ	\zzain	𝕫		
\hah	ح	\Hah	ﺣ	\hahh	ﺤ	\haha	ﺤﺎ	\HAH	ﺢ	\hhah	𝕙	\HHah	ℍ
\tah	ط	\Tah	ﻃ	\tahh	ﻄ	\taha	ﻄﺎ	\TAH	ﻂ	\ttah	𝕥	\TTah	𝕋
\yeh	ي	\Yeh	ﻳ	\yehh	ﻴ	\yeha	ﻴﺎ	\YEH	ﻲ	\yyeh	𝕪	\YYeh	𝕐
\kafA	ك	\Kaf	ﻛ	\kafh	ﻜ	\kafa	ﻜﺎ	\KAF	ﻚ	\kkaf	𝕜	\KKaf	𝕂
\lamA	ل	\Lam	ﻟ	\lamh	ﻠ			\LAM	ﻝ	\llam	𝕝	\LLam	𝕃
\meemA	م	\Meem	ﻣ	\meemh	ﻤ	\meema	ﻤﺎ	\MEEM	ﻢ	\mmeem	𝕞	\MMeem	𝕄
\noon	ن	\Noon	ﻧ	\noonh	ﻨ	\noona	ﻨﺎ	\NOON	ﻦ	\nnoon	𝕟	\NNoon	ℕ
\seenA	س	\Seen	ﺳ	\seenh	ﺴ	\seena	ﺴﺎ	\SEEN	ﺲ	\sseen	𝕤	\SSeen	𝕊
\ain	ع	\Ain	ﻋ	\ainh	ﻌ	\aina	ﻌﺎ	\AIN	ﻊ	\aain	𝕒	\AAin	𝔸
\feh	ف	\Feh	ﻓ	\fehh	ﻔ	\feha	ﻔﺎ	\FEH	ﻒ	\ffeh	𝕗	\FFeh	𝔽
\sadA	ص	\Sad	ﺻ	\sadh	ﺼ	\sada	ﺼﺎ	\SAD	ﺺ	\ssad	𝕤	\SSad	𝕊
\qafA	ق	\Qaf	ﻗ	\qafh	ﻘ	\qafa	ﻘﺎ	\QAF	ﻖ	\qqaf	𝕢	\QQaf	ℚ
\reh	ر							\REH	ﺭ	\rreh	𝕣		
\sheenA	ش	\Sheen	ﺷ	\sheenh	ﺸ	\sheena	ﺸﺎ	\SHEEN	ﺶ	\ssheen	𝕤	\SSheen	𝕊
\teh	ت	\Teh	ﺗ	\tehh	ﺘ	\teha	ﺘﺎ	\TEH	ﺖ	\tteh	𝕥	\TTeh	𝕋
\theh	ث	\Theh	ﺛ	\thehh	ﺜ	\theha	ﺜﺎ	\THEH	ﺚ	\ttheh	𝕥	\TTheh	𝕋
\khah	خ	\Khah	ﺧ	\khahh	ﺨ	\khaha	ﺨﺎ	\KHAH	ﺦ	\kkhah	𝕜	\KKhah	𝕂
\thal	ذ							\THAL	ﺫ	\tthal	𝕥		
\dadA	ض	\Dad	ﺿ	\dadh	ﻀ	\dada	ﻀﺎ	\DAD	ﺾ	\ddad	𝕕	\DDad	𝔻
\zah	ظ	\Zah	ﻇ	\zahh	ﻈ	\zaha	ﻈﺎ	\ZAH	ﻆ	\zzah	𝕫	\ZZah	ℤ
\ghain	غ	\Ghain	ﻏ	\ghainh	ﻐ	\ghaina	ﻐﺎ	\GHAIN	ﻎ	\gghain	𝕘	\GGhain	𝔾

Table 5: Mathematical basic alphabetic symbols

ISOLATED		INITIAL		TAILED		STRETCHED		LOOPED		ISOLATED DOUBLE-STRUCK		INITIAL DOUBLE-STRUCK	
\behd	ب	\Behd	بـ	\behdh	ـبـ	\behda	ـبا	\BEHd	ـبه	\bbehd	𝕓	\BBehd	𝔹
\yehd	ى							\YEHd	ـيه	\yyehd	𝕪		
\noond	ں							\NOONd	ـںه	\nnoond	𝕟		
\fehd	ف	\Fehd	فـ	\fehdh	ـفـ	\fehda	ـفا	\FEHd	ـفه	\ffehd	𝕗	\FFehd	𝔽
\qafd	ق							\QAFd	ـقه	\qqafd	𝕢		

Table 6: Mathematical dottles alphabetic symbols

PARTICULAR		PARTICULAR DOUBLE-STRUCK		EXCEPTIONAL	
\alefw	ٱ	\aalefw	𝕒	\pehA	ﭒ
\dalw	ٮ	\ddalw	𝕕	\PEH	ﭘ
\hehw	ھ	\hhehw	𝕙	\gheh	ﺢ
\zainw	ڒ	\zzainw	𝕫	\GHEH	ﺤ
\yehw	ے	\yyehw	𝕪	\veh	ﭤ
\kafw	ڪ	\kkafw	𝕜	\VEH	ﭥ
\kafww	ک	\kkafww	𝕜	\rheh	ﺦ
\lamalef	ﻻ	\llamalef	𝕝	\RHEH	ﺨ
\meemw	۾	\mmeemw	𝕞		
\noonw	ڼ	\nnoonw	𝕟		
\noonwd	ڼ	\nnoonwd	𝕟		
\noonww	ڻ	\nnoonww	𝕟		
\noonwwd	ڻ	\nnoonwwd	𝕟		
\rehw	ڑ	\rrehw	𝕣		
\hamzaA	ء	\hhamza	𝕙		

Table 7: Mathematical singular alphabetic symbols

\tail	~	\mdrwb	لـ	\nsfqtr	ىں	\tkaml		\mwjwd	E	\shrt	١	\zeroe	٠
\dailb	ـ	\teryf	تعر	\teryfd	ىعر	\tkamlw		\slwt	⸮	\shrtw	ا	\onee	١
\stretch	ـا	\mgmue	مجـ	\mgmuew	محـ	\tkamlo		\zawyt	∠	\salb	⌐	\twoe	٢
\onedot	.	\mgmued	مجـ	\mgmuedd	محـ	\tkamlow		\mgmuem		\jdr	√	\treee	٣
\twodot	..	\gdaa	جد	\gdaaw	حد	\tkamllo		\partrm		\jdrw	√	\foure	٤
\treedot	∴	\gdaad	جـ	\gdaadd	حـ	\tkamlllo		\complrm		\jdrww	√	\fivee	٥
\treedotw	^	\gdaaf	ـد	\gdaafd	ـد	\fslt	،	\fymate	٪	\jdrtlatte	∛	\sexe	٦
\oonedot	.	\nhayt	نها	\nhaytw	ىها	\circlew	○	\fyalfe	٪.	\jdrarbete	∛	\sevene	٧
\ttwodot	..	\nhaytd	نـ	\nhaytdd	ىـ	\crescentd	☾	\pertenthousande	٪..	\jdrtlattw	∛	\heigte	٨
\ttreedot	∴	\nhaytf	ـا	\nhaytfd	ـا	\crescentf	☽	\fyalf	‰	\jdrarbetw	∜	\ninee	٩
\ttreedotw	^	\kashidah	ـ			\nhytw	∞	\pertenthousandw	‱				

Table 8: Mathematical symbols

Name	Command	Example	Result with dots	Result without dots
Sine	\sin	$\sin c$	جا ش	حا ش
Cosine	\cos	$\cos c$	جتا ش	حتا ش
Tangent	\tan	$\tan c$	ظا ش	طا ش
Cotangent	\cot	$\cot c$	ظتا ش	طتا ش
Secant	\sec	$\sec c$	قا ش	قا ش
Cosecant	\csc	$\csc c$	قتا ش	قتا ش
Arc cine	\arcsin	$\arcsin c$	زجا ش	رحا ش
Arc cosine	\arccos	$\arccos c$	زجتا ش	رحتا ش
Arc tangent	\arctan	$\arctan c$	زظا ش	رطا ش
Arc cotangent	\arccot	$\arccot c$	زظتا ش	رطتا ش
Arc secant	\arcsec	$\arcsec c$	زقا ش	رقا ش
Arc cosecant	\arccsc	$\arccsc c$	زقتا ش	رقتا ش
Hyperbolic sine	\sinh	$\sinh c$	جاز ش	حاز ش
Hyperbolic cosine	\cosh	$\cosh c$	جتاز ش	حتار ش
Hyperbolic tangent	\tanh	$\tanh c$	ظاز ش	طار ش
Hyperbolic cotangent	\coth	$\coth c$	ظتاز ش	طتار ش
Hyperbolic secant	\sech	$\sech c$	قاز ش	قار ش
Hyperbolic cosecant	\csch	$\csch c$	قتاز ش	قتار ش
Arc hyperbolic sine	\arcsinh	$\arcsinh c$	زجاز ش	رحار ش
Arc hyperbolic cosine	\arccosh	$\arccosh c$	زجتاز ش	رحتار ش
Arc hyperbolic tangent	\arctanh	$\arctanh c$	زظاز ش	رطار ش
Arc hyperbolic cotangent	\arccoth	$\arccoth c$	زظتاز ش	رطتار ش
Arc hyperbolic secant	\arcsech	$\arcsech c$	زقاز ش	رقار ش
Arc hyperbolic cosecant	\arccsch	$\arccsch c$	زقتاز ش	رقتار ش
Logarithm	\lg	$\lg c$	لو ش	لو ش
Exponent	\exp	$\exp c$	قه ش	قه ش

Table 9: Usual functions