rexxmathlib

Thomas Richter

COLLABORATORS

	TITLE : rexxmathlib		
ACTION	*NAME*	*DATE*	*SIGNATURE*
WRITTEN BY	Thomas Richter	August 22, 2024	

REVISION HISTORY

NUMBER	DATE	DESCRIPTION	NAME

Contents

Chapter 1

rexxmathlib

1.1 main

```
RexxMathLib.Guide - First Aid about RexxMathLib © 1995 THOR-Software
Guide Version 1.01 / Library Version 38.01

Table of Contents

I.      What is it: Overview
II.     Function Index

        © THOR-Software
        Thomas Richter
        Rühmkorffstraße 10A

        12209 Berlin

        Germany

EMail:  thor@einstein.math.tu-berlin.de

The rexxmathlib.library is FREEWARE and copyrighted © 1995 by
Thomas Richter. No commercial use without perimission of the
author. Read the licence !

There is a bug in the mathieeedoubbas.library that comes with
Workbench 3.1. Read here to find out how to fix it.
```

1.2 The THOR-Software Licence

```
                The THOR-Software Licence

This License applies to the computer programs known as "RexxMathLib".
The "Program", below, refers to such program.

The programs and files in this distribution are freely distributable
under the restrictions stated below, but are also Copyright (c)
Thomas Richter.
```

1.3 overview

This library provides transcendential functions for the use with the ARexx - programming language. It is a complete new revision of Willy Langevelds rexxmathlib, although no original code has been used. The new release has been completely rewritten in assembly language and is therefore not only faster (approx. 10 times), but provides also a higher precision of 15.9 digits, thanks to cleverer ASCII- to Float conversion routines.
As an extra, some more functions have been added, see the Function Index, and the checking for proper function arguments are now more strictly.

To use this library in AREXX, add the following line to your
ARexx-script:

```
call addlib('rexxmathlib.library',0,-30,0)
```

The rexxmathlib.library will use the system math libraries, namely
the mathieeedoubbas.library and the mathieeedoubtrans.library and will
therefore work fine, regardless of a math-coprocessor.

There is a bug in the V38 mathieeedoubbas.library float-compare routine
resulting in a wrong ordering of negative numbers of small absolute value.

However, I included the necessary stuff to fix this bug. Read here
to find out how to do this.

1.4 How to fix the compare bug.

I advise you to fix the bug in the mathieeedoubbas library version 38.2,
that comes with Workbench 3.1. For copyright reasons, I can not provide
the patched library, but a patch file and a patch program. To apply the
patch:

```
1)      Copy the file LIBS:mathieeedoubbas.library to RAM:
2)      Copy the file mathieeedoubbas.pch, which comes with this archive,
        to RAM:
3)      Copy the program spatch, which is also included in this archive,
        to ram:
4)      Change the directory to ram: with
        cd ram:
5)      Apply the patch with
        spatch mathieeedoubbas.library
6)      Copy back the file RAM:mathieeedoubbas.new to
        LIBS:mathieeedoubbas.library. It contains the fixed library.
```

If any problems arise, make shure you use the original (CBM) version
of the library!

1.5 function_index

RexxMathLib.library - Function Index

```
  ABS ACOS  ACOSH ASIN
  ASINH ATAN  ATAN2 ATANH
  CEIL  COS COSEC COSH
  COT COTAN CSC E
  EPSM  EPSP  EXP FABS
  FACT  FLOOR FRACT INT
  LN  LOG LOG10 NINT
  PI  POL POW POWER
  ROOT  SEC SIN SINH
  SQR SQRT  TAN TANH
  XTOY
```

1.6 abs

```
NAME
        ABS(x),FABS(x)

        calculate absolute value of the argument

ARGUMENT REQUIREMENTS
        none

BUGS
        -ABS is never called by AREXX, cause it is provided as a
        AREXX build-in function. However, you SHOULD use FABS if
        you need the absolute value, cause it provides a higher
        precision than the build-in ABS

SEE ALSO
```

1.7 acos

```
NAME
        ACOS(x)

        calculate the inverse cosine of the argument
        (in radiants)

ARGUMENT REQUIREMENTS
        -1.0 <= x <= 1.0

BUGS

SEE ALSO
        COS
        SIN
        TAN
        ASIN
        ATAN
```

1.8 acosh

```
NAME
        ACOSH(x)

        calculate the inverse hyperbolic cosine of the argument

ARGUMENT REQUIREMENTS
        x >= 1.0
```

```
BUGS
        This function is implemented by the identity
        ACOSH(x)=LN(x+SQRT(x$^2$-1))
        and might cause an overflow if the argument of the
        logarithm overflows or x$^2$ is out of range.
        A second result of this implementation is a non-
        garantueed maximum precision.

SEE ALSO
        COSH
        SINH
        TANH
        ASINH
        ATANH
```

1.9 asin

```
NAME
        ASIN(x)

        calculate the inverse sine of the argument
        (in radiants)

ARGUMENT REQUIREMENTS
        -1.0 <= x <= 1.0

BUGS

SEE ALSO
        COS
        SIN
        TAN
        ACOS
        ATAN
```

1.10 asinh

```
NAME
        ASINH(x)

        calculate the inverse hyperbolic sine of the argument

ARGUMENT REQUIREMENTS
        none

BUGS
        This function is implemented by the identity
        ASINH(x)=LN(x+SQRT(x$^2$+1))
        and might cause an overflow if the argument of the
        logarithm overflows or x$^2$ is out of range.
        A second result of this implementation is a non-
        garantueed maximum precision.

SEE ALSO
        COSH
        SINH
        TANH
        ACOSH
        ATANH
```

1.11 atan

```
NAME
        ATAN(x)

        calculate the inverse tangent of the argument
        (in radiants)

ARGUMENT REQUIREMENTS
        none

BUGS
        As a result of finite precision, the inverse tangent of
        PI/2 is NOT infinity.

SEE ALSO
        COS
        SIN
        TAN
        ACOS
        ASIN
```

1.12 atan2

```
NAME
        ATAN2(y,x),POL(x,y)

        calculate the angle between the point (x|y) and the origin
        (in radiants)
        NOTE THE DIFFERENT ARGUMENT ORDERING OF ATAN2 AND POL !
        This function is also known as the argument-function
        of the complex number z=x+iy
        For *many* values of x and y is this argument identical
        to ATAN(x/y), but TRIES to provide a higher precision.

ARGUMENT REQUIREMENTS
        x<>0 | y<>0
        x and y must not be zero at the same time, however x=0
        OR y=0 is allowed.

BUGS

SEE ALSO
```

1.13 atanh

```
NAME
        ATANH(x)

        calculate the inverse hyperbolic tangent of the argument

ARGUMENT REQUIREMENTS
        -1.0 < x < 1.0

BUGS
        This function is implemented by the identity
        ASINH(x)=LN((1+x)/(1-x))/2
        and might cause an overflow if the argument of the
        logarithm overflows.
        A second result of this implementation is a non-
        garantueed maximum precision.

SEE ALSO
        COSH
        SINH
        TANH
        ACOSH
        ASINH
```

1.14 ceil

```
NAME
        CEIL(x)

        calculate the lowest integer higher than x

ARGUMENT REQUIREMENTS
        none

BUGS
        Not a bug, but you should note that this function
        results for negative values of x in a number of
        lower absolute value.
        So

        CEIL(2.5)=3

        but

        CEIL(-2.5)=-2

        However, this is the CORRECT mathematical implementation
        of CEIL !

SEE ALSO
        FLOOR
        FLOOR
        FRACT
        NINT
```

1.15 cos

```
NAME
        COS(x)

        calculate the cosine of the argument
        (in radiants)

ARGUMENT REQUIREMENTS
        none

BUGS
        As a result of finite precision, the cosine of x
        of high absolute value is more or less random.

SEE ALSO
        SIN
        TAN
        ACOS
        ASIN
        ATAN
```

1.16 cosec

```
NAME
        COSEC(x),CSC(x)

        calculate the cosecans of the argument
        (in radiants)

ARGUMENT REQUIREMENTS
        x<>0

BUGS
        As a result of finite precision, the cosecans of
        integer multiples of PI is not infinity, also for
        x of high absolute value the result is more or
        less random.

SEE ALSO
        SEC
        COT
        COTAN
```

1.17 cosh

```
NAME
        COSH(x)

        calculate the hyperbolic cosine of the argument

ARGUMENT REQUIREMENTS
        -700 < x < 700 (approx.)

BUGS

SEE ALSO
        SINH
        TANH
        ACOSH
        ASINH
        ATANH
```

1.18 cot

```
NAME
        COT(x),COTAN(x)

        calculate the hyperbolic cotangent of the argument
        (in radiants)

ARGUMENT REQUIREMENTS
        x<>0

BUGS
        As a result of finite precision, the cotangent of PI/2
        is not zero.

SEE ALSO
        TAN
        SEC
        COSEC
        CSC
```

1.19 e

```
NAME
        E(x)

        return the value of E, the base of the natural
        logarithm. The argument is not used.

ARGUMENT REQUIREMENTS
        none

BUGS
        The result has a precision of 17 digits, although
        rexxmathlib has only a precision 15.9 digits
        (and AREXX of 14 digits)

SEE ALSO
        PI
```

1.20 epsm

```
NAME
        EPSM(x)

        return the highest floating point number lower than and
        distinguishable from x

ARGUMENT REQUIREMENTS
        none

BUGS
        The result is only useful as input for mathrexxlib, cause
        AREXX itself has a limited precision of 14 digits and
        so EPSM(x)=x for AREXX.

SEE ALSO
        EPSP
```

1.21 epsp

```
NAME
        EPSP(x)

        return the lowest floating point number higher than and
        distinguishable from x

ARGUMENT REQUIREMENTS
        none

BUGS
        The result is only useful as input for mathrexxlib, cause
        AREXX itself has a limited precision of 14 digits and
        so EPSP(x)=x for AREXX.

SEE ALSO
        EPSM
```

1.22 exp

```
NAME
        EXP(x)

        calculate the exponential function
```

```
ARGUMENT REQUIREMENTS
        x < 700 (approx.)

BUGS

SEE ALSO
        E
        LOG
        LN
```

1.23 fact

```
NAME
        FACT(x)

        calculate the factorial function of x

ARGUMENT REQUIREMENTS
        x>=0 & x<=87 & x integer

BUGS
        For x lower or equal than 12, the result is calculated in
        integers, for higher x floating point numbers are used, so
        the result might be a non-integer.
        This call should really evaluate the Gamma-function for
        non-integer x, but this is a non-trivial task !

SEE ALSO
```

1.24 floor

```
NAME
        FLOOR(x),INT(x)

        calculate the highest integer lower than x

ARGUMENT REQUIREMENTS
        none

BUGS
        Not a bug, but you should note that this function
        results for negative values of x in a number of
        higher absolute value.
        So

        INT(2.5)=2

        but

        INT(-2.5)=-3
        However, this is the CORRECT mathematical implementation
        of INT !

SEE ALSO
        CEIL
        FRACT
        NINT
```

1.25 fract

```
NAME
        FRACT(x)

        calculate the fractional part of x

ARGUMENT REQUIREMENTS
        none

BUGS
        Not a bug, but you should note that this function
        results for negative values of x also in a positive
        number, cause it is implemented as x-FLOOR(x).

        So

        FLOOR(2.4)=0.4

        but

        INT(-2.4)=0.6

        However, this is the CORRECT mathematical implementation
        of FRACT !

SEE ALSO
        CEIL
        FRACT
        NINT
```

1.26 log

```
NAME
        LN(x),LOG(x)

        calculate the natural logarithm of x

ARGUMENT REQUIREMENTS
        x>0

BUGS

SEE ALSO
```

```
        E
        EXP
        LOG10
```

1.27 log10

```
NAME
        LOG10(x)

        calculate the decadic logarithm of x

ARGUMENT REQUIREMENTS
        x>0

BUGS

SEE ALSO
        LOG
        LN
```

1.28 nint

```
NAME
        NINT(x)

        calculate the nearest integer to x

ARGUMENT REQUIREMENTS
        none

BUGS
        Not a bug, but you should note that this function
        results for negative values of x with a fractional
        part of 0.5 in a different integer than for positive
        x. So

        NINT(2.5)=3

        but

        NINT(-2.5)=-2

        However, this is the CORRECT mathematical implementation
        of NINT, but differs from the behavior of the old version
        of rexxmathlib.

SEE ALSO
        FLOOR
        INT
        CEIL
        FRACT
```

1.29 pi

```
NAME
        PI(x)

        return the value of PI. The argument is not used.

ARGUMENT REQUIREMENTS
        none

BUGS
        The result has a precision of 17 digits, although
        rexxmathlib has only a precision 15.9 digits
        (and AREXX of 14 digits)

SEE ALSO
        E
```

1.30 pow

```
NAME
        POW(x,y),POWER(x,y),XTOY(x,y)

        return x to the power of y

ARGUMENT REQUIREMENTS
        messy...
        For non-integer y x must be positive or zero.
        For integer y x can be both positive or negative,
        however x and y must not be both zero.
        A second requirement is that both x and y must not
        be "to large".

BUGS
        0 to the power of 0 is not allowed, although the old
        version of rexxmathlib can handle this. However, 0^0
        is mathematically not well defined and can be both,
        zero or one.

SEE ALSO
        ROOT
```

1.31 root

```
NAME
        ROOT(x,y)

        return the yth root of x

ARGUMENT REQUIREMENTS
        messy...
        For non-integer y x must be positive or zero.
        For integer and odd y x can be both positive or negative,
        y must be non-zero.
        A second requirement is that x must not
        be "to large" and y not "to small".

BUGS
        For y beeing 1 x is returned immediatly and
        for y beeing 2 the square-root function is
        used. All other arguments are passed to
        POW, except for the extra sign handling of
        odd roots. This is a real mess...

SEE ALSO
        POW
        POWER
        XTOY
```

1.32 sec

```
NAME
        SEC(x)

        calculate the secans of the argument
        (in radiants)

ARGUMENT REQUIREMENTS
        none

BUGS
        As a result of finite precision, the secans of
        integer odd multiples of PI/2 is not infinity, also for
        x of high absolute value the result is more or
        less random.

SEE ALSO
        COSEC
        CSC
        COT
        COTAN
```

1.33 sin

```
NAME
        SIN(x)

        calculate the sine of the argument
        (in radiants)

ARGUMENT REQUIREMENTS
        none

BUGS
```

```
        As a result of finite precision, the sine of x
        of high absolute value is more or less random.

SEE ALSO
        COS
        TAN
        ACOS
        ASIN
        ATAN
```

1.34 sinh

```
NAME
        SINH(x)

        calculate the hyperbolic sine of the argument

ARGUMENT REQUIREMENTS
        -700 < x < 700 (approx.)

BUGS

SEE ALSO
        COSH
        TANH
        ACOSH
        ASINH
        ATANH
```

1.35 sqr

```
NAME
        SQR(x),SQRT(x)

        calculate the square root of x

ARGUMENT REQUIREMENTS
        x >= 0

BUGS

SEE ALSO
        ROOT
        POW
        POWER
        XTOY
```

1.36 tan

```
NAME
        TAN(x)

        calculate the tangent of the argument
        (in radiants)

ARGUMENT REQUIREMENTS
        none

BUGS
        As a result of finite precision, the tangent of PI/2
        is not infinity, also for x of high absolute value is
        more or less random.

SEE ALSO
        COS
        SIN
        ACOS
        ASIN
        ATAN
```

1.37 tanh

```
NAME
        TANH(x)

        calculate the hyperbolic tangent of the argument
        (in radiants)

ARGUMENT REQUIREMENTS
        none

BUGS

SEE ALSO
        COSH
        SINH
        ACOSH
        ASINH
        ATANH
```