Package ‘lamW’

April 25, 2017

Type Package
Title Lambert-W Function
Version 1.3.0
Date 2017-04-24
Description Implements both real-valued branches of the Lambert-W function, also known as the product logarithm, without the need for installing the entire GSL.
License BSD_2_clause + file LICENSE
Depends R (>= 3.0.2)
Imports Rcpp, RcppParallel (>= 4.3.20)
LinkingTo Rcpp, RcppParallel (>= 4.3.20)
SystemRequirements GNU make
Suggests testthat
NeedsCompilation yes
URL https://bitbucket.org/aadler/lamw
BugReports https://bitbucket.org/aadler/lamw/issues
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Repository CRAN
Date/Publication 2017-04-24 22:17:14 UTC

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Description

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Details

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Author(s)

Avraham Adler <Avraham.Adler@gmail.com>

Usage

lambertW0(x)
lambertWm1(x)

Arguments

x vector of values
Details

The Lambert-W function is defined for all real \( x \geq -\frac{1}{e} \). It has two values in the interval \((-\frac{1}{e}, 0)\). The values strictly greater than -1 are assigned to the “principal” branch, also referred to as \( W_0 \), and the values strictly less than -1 are assigned to a secondary branch, referred to as \( W_{-1} \). For non-negative \( x \), only the principal branch exists as the other real-valued branch approaches negative infinity as \( x \) approaches 0. The algorithms used to calculate the values predominantly follow those in the reference, with some simplifications. There are many applications in which the Lambert-W function is useful, such as combinatorics, physics, and hydrology. The interested reader is directed to the references for more detail.

Value

Both functions return the appropriate values in the intervals for which they are defined. Outside of those intervals, they will return NaN, except that \( \text{lambertw0}(\text{Inf}) \) will return its limit \( \text{Inf} \) and \( \text{lambertwm1}(\text{0}) \) will return its limit \( -\text{Inf} \).

Author(s)

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References


See Also

This package provides similar functionality to the \text{Lambert} functions in the \text{gsl} package without having to obtain or install the GSL.

Examples

```r
lambertw0(exp(1)) ## Should equal 1, as 1 * exp(1) = e.
lambertw0(0) ## Should equal 0, as 0 * exp(0) = 0.
lambertw0(-exp(-1)) ## Should equal -1.
lambertwm1(-exp(-1)) ## Should also equal -1.
A <- -2 * exp(-2)
lambertwm1(A) ## Should equal -2
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