Package 'Carlson'

Type Package

Title Carlson Elliptic Integrals and Incomplete Elliptic Integrals

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Description Evaluation of the Carlson elliptic integrals and the incomplete elliptic integrals with complex arguments. The implementations use Carlson's algorithms <doi.org/10.1007/BF02198293>. Applications of elliptic integrals include probability distributions, geometry, physics, mechanics, electrodynamics, statistical mechanics, astronomy, geodesy, geodesics on conics, and magnetic field calculations.

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Encoding UTF-8

LazyData true

RoxygenNote 7.0.2

Suggests gsl, testthat

URL https://github.com/stla/Carlson

BugReports https://github.com/stla/Carlson/issues

NeedsCompilation no

Repository CRAN

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R topics documented:

Carlson_RC   *Carlson elliptic integral RC*

Description

Evaluate the Carlson elliptic integral RC.

Usage

```
Carlson_RC(x, y, minerror = 2 * .Machine$double.eps)
```

Arguments

x, y   real or complex numbers, with y different from 0

minerror   bound on the relative error passed to `Carlson_RF`

Value

A complex number, the value of the Carlson elliptic integral $R_C(x, y)$.

Note

The function returns a value when x or y are negative real numbers, but this value is not the one of the Carlson integral.

Examples

```
Carlson_RC(5, 2)
gsl::ellint_RC(5, 2)
```

Carlson_RD   *Carlson elliptic integral RD*

Description

Evaluate the Carlson elliptic integral RD.

Usage

```
Carlson_RD(x, y, z, minerror = 2 * .Machine$double.eps)
```

Arguments

x, y, z	real or complex numbers; at most one can be 0
minerror	bound on the relative error

Value

A complex number, the value of the Carlson elliptic integral $R_D(x, y, z)$.

Note

The function returns a value when x, y or z are negative real numbers, but this value is not the one of the Carlson integral.

Examples

```
Carlson_RD(5, 2, 3)
gsl::ellint_RD(5, 2, 3)
```

Carlson_RF   *Carlson elliptic integral RF*

Description

Evaluate the Carlson elliptic integral RF.

Usage

```
Carlson_RF(x, y, z, minerror = 2 * .Machine$double.eps)
```

Arguments

x, y, z	real or complex numbers; at most one can be 0
minerror	bound on relative error

Value

A complex number, the value of the Carlson elliptic integral $R_F(x, y, z)$.

Note

The function returns a value when x, y or z are negative real numbers, but this value is not the one of the Carlson integral.

Examples

```
Carlson_RF(5, 2, 3)
gsl::ellint_RF(5, 2, 3)
```

Carlson_RG   *Carlson elliptic integral RG*

Description

Evaluate the Carlson elliptic integral RG.

Usage

```
Carlson_RG(x, y, z, minerror = 2 * .Machine$double.eps)
```

Arguments

x, y, z	real or complex numbers; they can be zero
minerror	bound on the relative error passed to `Carlson_RF` and `Carlson_RD`

Value

A complex number, the value of the Carlson elliptic integral $R_G(x, y, z)$.

Carlson_RJ   *Carlson elliptic integral RJ*

Description

Evaluate the Carlson elliptic integral RJ.

Usage

```
Carlson_RJ(x, y, z, p, minerror = 2 * .Machine$double.eps)
```

Arguments

x, y, z, p   real or complex numbers; at most one can be 0

minerror   bound on the relative error

Value

A complex number, the value of the Carlson elliptic integral $R_J(x, y, z, t)$.

Note

The function returns a value when x, y, z or p are negative real numbers, but this value is not the one of the Carlson integral.

Examples

```
Carlson_RJ(5, 2, 3, 4)
gsl::ellint_RJ(5, 2, 3, 4)
```

---

elliptic_E   *Incomplete elliptic integral of the second kind*

Description

Evaluate the incomplete elliptic integral of the second kind.

Usage

```
elliptic_E(phi, m, minerror = 2 * .Machine$double.eps)
```

Arguments

phi   amplitude, real or complex number

m   parameter, real or complex number

minerror   the bound on the relative error passed to Carlson_RF and Carlson_RD

Value

A complex number, the value of the incomplete elliptic integral $E(\phi, m)$.

Examples

```
elliptic_E(1, 0.2)
gsl::ellint_E(1, sqrt(0.2))
```

| elliptic_F | *Incomplete elliptic integral of the first kind* |

Description

Evaluate the incomplete elliptic integral of the first kind.

Usage

```
elliptic_F(phi, m, minerror = 2 * .Machine$double.eps)
```

Arguments

phi	amplitude, real or complex number
m	parameter, real or complex number
minerror	the bound on the relative error passed to [Carlson_RF](#)

Value

A complex number, the value of the incomplete elliptic integral $F(\phi, m)$.

Examples

```
elliptic_F(1, 0.2)
gsl::ellint_F(1, sqrt(0.2))
```

| elliptic_PI | *Incomplete elliptic integral of the third kind* |

Description

Evaluate the incomplete elliptic integral of the third kind.

Usage

```
elliptic_PI(phi, n, m, minerror = 2 * .Machine$double.eps)
```

Arguments

phi	amplitude, real or complex number
n	characteristic, real or complex number
m	parameter, real or complex number
minerror	the bound on the relative error passed to [Carlson_RF](#) and [Carlson_RJ](#)

Value

A complex number, the value of the incomplete elliptic integral $\Pi(\phi, n, m)$.

Examples

```
elliptic_PI(1, 0.8, 0.2)
gsl::ellint_P(1, sqrt(0.2), -0.8)
```

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elliptic_Z	*Jacobi zeta function*

Description

Evaluate the Jacobi zeta function.

Usage

```
elliptic_Z(phi, m, minerror = 2 * .Machine$double.eps)
```

Arguments

phi	amplitude, real or complex number
m	parameter, real or complex number
minerror	bound on relative error passed to elliptic_E and elliptic_F

Value

A complex number, the value of the Jacobi zeta function $Z(\phi, m)$.

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