Package ‘cubicBsplines’

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**Bsplines**

*Computation of a cubic B-spline basis associated to a given vector of knots*

**Description**

Computation of a cubic B-spline basis associated to a given vector of knots

**Usage**

`Bsplines(x, knots)`

**Arguments**

- `x` vector of values where the B-spline basis must be evaluated.
- `knots` vector of knots spanning the desired B-spline basis.

**Value**

A matrix of dimension `length(x)` by `(length(knots)+2)`. Each column of the matrix corresponds to one cubic B-spline in the basis.

**Examples**

`Bsplines(x=runif(20), knots=seq(0, 1, length=11))`

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**D1Bsplines**

*Computation of the 1st derivative of a cubic B-spline basis associated to a given vector of knots*

**Description**

Computation of the 1st derivative of a cubic B-spline basis associated to a given vector of knots

**Usage**

`D1Bsplines(x, knots)`

**Arguments**

- `x` vector of values where the 1st derivative of the B-spline basis must be evaluated.
- `knots` vector of knots spanning the desired B-spline basis.
**Value**

A matrix of dimension \(\text{length}(x)\) by \((\text{length}(\text{knots})+2)\).

Each column corresponds to (the 1st derivative of) one cubic B-spline in the basis.

**Examples**

```r
D1Bsplines(x=runif(20),knots=seq(0,1,length=11))
```

---

**Description**

Computation of the 2nd derivative of a cubic B-spline basis associated to a given vector of knots

**Usage**

```r
D2Bsplines(x, knots)
```

**Arguments**

- `x` vector of values where the 2nd derivative of the B-spline basis must be evaluated.
- `knots` vector of knots spanning the desired B-spline basis.

**Value**

A matrix of dimension \(\text{length}(x)\) by \((\text{length}(\text{knots})+2)\).

Each column of the matrix corresponds to (the 2nd derivative of) one cubic B-spline in the basis.

**Examples**

```r
D2Bsplines(x=runif(20),knots=seq(0,1,length=11))
```
IBsplines

Computation of the integral of a cubic B-spline basis over \((t_0,x)\) for a given vector of knots

**Description**

Computation of the integral of a cubic B-spline basis over \((t_0,x)\) for a given vector of knots

**Usage**

\[ \text{IBsplines}(t_0, x, \text{knots}) \]

**Arguments**

- \(t_0\): scalar giving lower value of the integration interval.
- \(x\): vector giving the upper values of the integration interval.
- \(\text{knots}\): vector of knots spanning the desired B-spline basis.

**Value**

A matrix of dimension \(\text{length}(x)\) by \((\text{length}(\text{knots})+2)\). Each integrated cubic B-spline is within a given column.

**Examples**

\[ \text{IBsplines}(t_0=0, x=\text{runif}(20), \text{knots}=\text{seq}(0,1,\text{length}=11)) \]

trapeze

Trapeze integration from a vector of function values evaluated at quadrature points

**Description**

Trapeze integration from a vector of function values evaluated at quadrature points

**Usage**

\[ \text{trapeze}(x, \text{fx}) \]

**Arguments**

- \(x\): grid of values for the quadrature (vector).
- \(\text{fx}\): values of the function on the grid (vector).
Value

vector with a numerical approximation of \( \int_{\min(x)}^{\max(x)} f(t) dt \) on the grid using the trapeze method.

Examples

```r
x = seq(-4,2,length=100) ; fx = dnorm(x) ; res = trapeze(x,fx)
cbind(true=pnorm(x),trapeze=res)
```
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