

Package ‘gmpoly’

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Type Package

Title Multivariate Polynomials with Rational Coefficients

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Description Symbolic calculation (addition or multiplication) and evaluation of multivariate polynomials with rational coefficients.

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Encoding UTF-8

Imports gmp, purrr, mvp, english

RoxygenNote 7.1.2

URL <https://github.com/stla/gmpoly>

BugReports <https://github.com/stla/gmpoly/issues>

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gmpoly	<i>Define a multivariate polynomial</i>
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Description

Define a multivariate polynomial from a string or from its coefficients and powers.

Usage

```
gmpoly(string, coeffs = NULL, powers = NULL)
```

Arguments

string	a string such as " $x^{(1,2,1)} + 4 x^{(0,2,3)}$ ", or you can define the polynomial with <code>coeffs</code> and <code>powers</code> ; in this case set <code>string</code> to <code>NULL</code> or to nothing (i.e. missing)
coeffs	the coefficients of the polynomial, in case you don't define it with the <code>string</code> argument; this must be a vector of <code>bigq</code> numbers
powers	the powers of the polynomial, in case you don't define it with the <code>string</code> argument; this must be a matrix of integers, one row for each term (hence <code>nrow(powers)</code> must equal <code>length(coeffs)</code>), and the number of columns is the number of variables

Value

A `gmpoly` object.

Examples

```
library(gmpoly)
gmpoly("5/2 x^(2,3) + 3 x^(1,1)")
gmpoly("5/2 x^(2,3) - 3 x^(1,1)")
gmpoly("-x^(1,2,3) + 4/7 x^(3,1,1)")
library(gmp)
gmpoly(
  coeffs = as.bigq(c(5, 7), c(8, 9)),
  powers = rbind(c(1, 1, 1), c(2, 2, 2))
)
```

gmpoly2mvp	<i>Conversion to 'mvp' polynomial</i>
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Description

Convert a [gmpoly](#) polynomial to a [mvp](#) polynomial.

Usage

```
gmpoly2mvp(pol)
```

Arguments

pol a [gmpoly](#) object

Value

A [mvp](#) object.

Examples

```
library(gmpoly)
pol <- gmpoly("5/2 x^(2,2,3) + 3 x^(1,0,1)")
gmpoly2mvp(pol)
```

gmpolyConstant	<i>Constant multivariate polynomial</i>
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Description

Constructs a constant multivariate polynomial.

Usage

```
gmpolyConstant(m, value)
```

Arguments

m number of variables, a strictly positive integer
value the constant value of the polynomial; the [as.bigq](#) function is applied to this argument, so it can be e.g. an integer or a character string such as "2/3" (avoid decimal numbers)

Value

A [gmpoly](#) object.

Examples

```
library(gmpoly)
gmpolyConstant(3, "2/3")
```

gmpolyEval

Evaluation of a multivariate polynomial

Description

Evaluates a gmpoly multivariate polynomial for given values of the variables.

Usage

```
gmpolyEval(pol, x)
```

Arguments

pol	a gmpoly object
x	either a bigq vector, or a bigq matrix; in the later case, the evaluation is performed for each row of the matrix

Value

A [bigq](#) number or vector.

Examples

```
library(gmpoly)
library(gmp)
pol <- gmpoly("5/2 x^(2,3) + 3 x^(1,1)")
gmpolyEval(pol, as.bigq(c(1, 1)))
x <- rbind(
  t(as.bigq(c(1, 1))),
  t(as.bigq(c(3, 4), c(4, 3)))
)
gmpolyEval(pol, x)
```

gmpolyGrow	<i>Grow polynomial</i>
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Description

Grow a multivariate polynomial by including a new variable.

Usage

```
gmpolyGrow(pol)
```

Arguments

pol a [gmpoly](#) object

Value

The "same" multivariate polynomial as pol, except that it has an additional variable.

Examples

```
library(gmpoly)
pol <- gmpoly("3 x^(1,2) - 1/7 x^(5,3)")
gmpolyGrow(pol)
```

Ops.gmpoly	<i>Arithmetic operators for multivariate polynomials</i>
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Description

Arithmetic operators for multivariate polynomials

Usage

```
## S3 method for class 'gmpoly'
Ops(e1, e2 = NULL)
```

Arguments

e1, e2 for an unary operator, only e1 must be given, a [gmpoly](#) object; for a binary operator, at least one of e1 and e2 must be a [gmpoly](#) object, and the other must be a [gmpoly](#) object as well or a scalar; the power operator (^) is an exception: one can only raise a [gmpoly](#) object to a positive integer power

Value

A [gmpoly](#) object.

Examples

```
library(gmpoly)
pol <- gmpoly("4 x^(2, 1, 1) + 1/2 x^(0,1,0)")
+pol
-pol
2 * pol
pol / 2
pol + 5
pol - 5
pol^2
pol1 <- gmpoly("2 x^(1,1) - 5/3 x^(0,1)")
pol2 <- gmpoly("-2 x^(1,1) + 3 x^(2,1)")
pol1 + pol2
pol1 * pol2
pol1 == pol2
pol1 != pol2
```

print.gmpoly

Print a multivariate polynomial

Description

Print a multivariate polynomial of class gmpoly.

Usage

```
## S3 method for class 'gmpoly'
print(x, ...)
```

Arguments

x	a gmpoly object
...	ignored

Value

No value, just prints the polynomial.

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