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Chapter 1

Classes

1.1 poly.ring – polynomial rings

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1.1.1 PolynomialRing – ring of polynomials

A class for uni-/multivariate polynomial rings. A subclass of **CommutativeRing**.

Initialize (Constructor)

PolynomialRing(`coeffring`: ***CommutativeRing***, `number_of_variables`: ***integer***=**1**)
→ ***PolynomialRing***

`coeffring` is the ring of coefficients. `number_of_variables` is the number of variables. If its value is greater than 1, the ring is for multivariate polynomials.

Attribute

zero :
zero of the ring.

one :
one of the ring.

Methods

1.1.1.1 getInstance – classmethod

getInstance(coeffring: ***CommutativeRing***, number_of_variables: ***integer***)
→ ***PolynomialRing***

return the instance of polynomial ring with coefficient ring `coeffring` and number of variables `number_of_variables`.

1.1.1.2 getCoefficientRing

getCoefficientRing() → CommutativeRing

1.1.1.3 getQuotientField

getQuotientField() → Field

1.1.1.4 issubring

issubring(other: ***Ring***) → ***bool***

1.1.1.5 issuperring

issuperring(other: ***Ring***) → ***bool***

1.1.1.6 getCharacteristic

getCharacteristic() → ***integer***

1.1.1.7 createElement

createElement(seed) → ***polynomial***

Return a polynomial. `seed` can be a polynomial, an element of coefficient ring, or any other data suited for the first argument of uni-/multi-variate polynomials.

1.1.1.8 gcd

gcd(a, b) → ***polynomial***

Return the greatest common divisor of given polynomials (if possible). The polynomials must be in the polynomial ring. If the coefficient ring is a field, the result is monic.

1.1.1.9 isdomain

1.1.1.10 iseuclidean

1.1.1.11 isnoetherian

1.1.1.12 ispid

1.1.1.13 isufd

Inherited from **CommutativeRing**.

1.1.2 RationalFunctionField – field of rational functions

Initialize (Constructor)

RationalFunctionField(`field`: ***Field***, `number_of_variables`: ***integer***)
→ ***RationalFunctionField***

A class for fields of rational functions. It is a subclass of **QuotientField**.

`field` is the field of coefficients, which should be a **Field** object. `number_of_variables` is the number of variables.

Attribute

zero :
zero of the field.

one :
one of the field.

Methods

1.1.2.1 getInstance – classmethod

getInstance(coefffield: ***Field***, number_of_variables: ***integer***)
→ ***RationalFunctionField***

return the instance of `RationalFunctionField` with coefficient field `coefffield` and number of variables `number_of_variables`.

1.1.2.2 createElement

createElement(*seedarg: ***list***, **seedkwd: ***dict***) → ***RationalFunction***

1.1.2.3 getQuotientField

getQuotientField() → ***Field***

1.1.2.4 issubring

issubring(other: ***Ring***) → ***bool***

1.1.2.5 issuperring

issuperring(other: ***Ring***) → ***bool***

1.1.2.6 unnest

unnest() → ***RationalFunctionField***

If self is a nested `RationalFunctionField` i.e. its coefficient field is also a `RationalFunctionField`, then the method returns one level unnested `RationalFunctionField`.

For example:

Examples

```
>>> RationalFunctionField(RationalFunctionField(Q, 1), 1).unnest()
RationalFunctionField(Q, 2)
```

1.1.2.7 gcd

gcd(a: ***RationalFunction***, b: ***RationalFunction***) → ***RationalFunction***

Inherited from **Field**.

1.1.2.8 isdomain

1.1.2.9 iseuclidean

1.1.2.10 isnoetherian

1.1.2.11 ispid

1.1.2.12 isufd

Inherited from **CommutativeRing**.

1.1.3 PolynomialIdeal – ideal of polynomial ring

A subclass of **Ideal** represents ideals of polynomial rings.

Initialize (Constructor)

PolynomialIdeal(`generators`: ***list***, `polyring`: ***PolynomialRing***)
→ ***PolynomialIdeal***

Create an object represents an ideal in a polynomial ring `polyring` generated by `generators`.

Operations

operator	explanation
`in`	membership test
`==`	same ideal?
`!=`	different ideal?
`+`	addition
`*`	multiplication

Methods

1.1.3.1 reduce

reduce(`element`: ***polynomial***) → ***polynomial***

Modulo `element` by the ideal.

1.1.3.2 issubset

issubset(`other`: ***set***) → ***bool***

1.1.3.3 issuperset

issuperset(`other`: ***set***) → ***bool***

Bibliography