

# **pfpcoh (cohomology/homology groups for $p \nmid q$ )**

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## 1 $pF_q$ に関する (コ) ホモロジー

この節では超幾何関数  $pF_q$  ( ${}_pF_q$ ) の (コ) ホモロジー群に関連した不変量を計算する関数を解説する.

OpenXM/Risa/Asir での利用にあたっては,

```
load("pfpcoh.rr")$ load("pfphom.rr")$
```

が始めに必要.

### 1.0.1 pfp\_omega

`pfp_omega(P)`

: It returns the Gauss-Manin connection  $\Omega$  for the generalized hypergeometric function  $P F_{P-1}(aa_1, aa_2, \dots; cc_1, cc_2, \dots; x)$ .

Description:

Define a vector valued function  $Y$  of which elements are generalized hypergeometric function  $f_1=F$  and  $f_2=xd f_1/dx$ ,  $f_3=xd f_2/dx$ , ... It satisfies  $dY/dx=\Omega Y$ . Generalized hypergeometric function is defined by the series  $p F_{p-1}(aa_1, aa_2, \dots; cc_1, cc_2, \dots; x) = \sum_{k=0, \infty} (aa_1)_k (aa_2)_k \dots / (1)_k (cc_1)_k (cc_2)_k \dots x^k$

Example:

```
pfp_omega(3);
```

### 1.0.2 pfpcoh\_intersection

`pfpcoh_intersection(P)`

: `pfpcoh_intersection(P)` returns an intersection matrix for cocycles associated to the generalized hypergeometric function  $p F_{p-1}$ .

Description:

This program `pfpcoh.rr` computes an intersection matrix  $S$  of cocycles of  $p F_{p-1}$  and compares it with the matrix obtained by solving a differential equation for intersection matrix.

Algorithm:

Ohara, Sugiki, Takayama, Quadratic Relations for Generalized Hypergeometric Functions  $p F_{p-1}$

Example:

```
load("pfpcoh.rr")$
S=pfpcoh_intersection(3);
```

Author : K.Ohara

### 1.0.3 pfphom\_intersection

`pfphom_intersection(P)`

: intersection matrix of homology cycles.

Description:

Computing intersection matrix of cycles associated to  $pF_{p-1}$ . As to the meaning of parameters  $c_1, c_2, c_3, \dots$ , see the paper Ohara, Kyushu J. Math. Vol. 51 PP.123.

Algorithm:

Ohara, Sugiki, Takayama, Quadratic Relations for Generalized Hypergeometric Functions  $pF_{p-1}$

Example:

```
SS = pfphom_intersection(3)$
```

You get the intersection matrix of homologies for  $3F_2$ .

Author : K.Ohara

#### 1.0.4 pfphom\_monodromy\_pair\_kyushu

```
pfphom_monodromy_pair_kyushu(P)
```

```
:
```

Description:

It returns the pair of monodromy matrices.

Algorithm:

Ohara, Kyushu J. Math. Vol.51 PP.123 (1997)

Example:

```
MP = pfphom_monodromy_pair_kyushu(3)$
```

You get a pair of monodromy matrices for  $3F_2$  standing for two paths encircling 0 and 1.

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