

Dsolv マ

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Edition : auto generated by oxgentexi on 8 June 2017

OpenXM.org

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# 1 DSOLV 醇

```

        鎧脰違      醇違や .      眼 冴 や [SST]      .      宴若吾      漚漚
load("dsolv.rr");      若 .      宴若吾 Diff Dmodule 餚睡 .
        OpenXM/Risa/Asir      c ,
        load("dsolv.rr");$
        紫 荀.
        宴若吾 ox_sm1      . c 戎      紊違 sm1 宴若吾 罕 違や .

```

## 1.1 醇違荀

### 1.1.1 dsolv\_dual

```

dsolv_dual(f,v)
    :: f 違 絲
祉      鴻
f, v      鴻
    • 紊 v 箏 縹違 , f 違 絲障罷.
    • f や , v 罐球えや 絲障, primary      . primary      翫, 醇違      若 <.
Algorithm: 醇違 [SST] Algorithm 2.3.14 茗 . 阪箏      x, y, ... log(x), log(y), ..., ,
log 紊縹, f_(x->x*dx, y->y*dy, ...) 縹 合縹脰      c .

```

```

[435] dsolv_dual([y-x^2,y+x^2],[x,y]);
[x,1]
[436] dsolv_act(y*dy-sm1.mul(x*dx,x*dx,[x,y]),log(x),[x,y]);
0
[437] dsolv_act(y*dy+sm1.mul(x*dx,x*dx,[x,y]),log(x),[x,y]);
0

[439] primadec([y^2-x^3,x^2*y^2],[x,y]);
[[[y^2-x^3,y^4,x^2*y^2],[y,x]]]
[440] dsolv_dual([y^2-x^3,x^2*y^2],[x,y]);
[x*y^3+1/4*x^4*y, x^2*y, x*y^2+1/12*x^4, y^3+x^3*y,
  x^2, x*y, y^2+1/3*x^3, x, y, 1]

[441] dsolv_test_dual();
Output is omitted.

```

### 1.1.2 dsolv\_starting\_term

```

dsolv_starting_term(f,v,w)
    :: 罩 e      鎧 f 劫 w      域 Starting terms 荐膊. , v 違 .
祉      鴻

```

$f, v, w$  鴻

- 罩  $e$  鎧  $f$  劫  $w$  域 Staring terms 荐膊. ,  $v$  違 .
- 祉や 就 :  $[[e1, e2, \dots], [s1, s2, \dots]]$   $e1$  exponent  $s1$  絲上茹  $c$  , 篁  
ヤ罕.
- 紊 Dsolv\_message\_starting\_term 1 , 醇違 膊 箏 <祉若吾阪.

Algorithm: Saito, Sturmfels, Takayama, Grobner Deformations of Hypergeometric Differential Equations ([SST]), Chapter 2.

```
[1076] F = sm1.gkz( [ [[1,1,1,1,1],[1,1,0,-1,0],[0,1,1,-1,0]], [1,0,0]]);
[[x5*dx5+x4*dx4+x3*dx3+x2*dx2+x1*dx1-1,-x4*dx4+x2*dx2+x1*dx1,
-x4*dx4+x3*dx3+x2*dx2,
-dx2*dx5+dx1*dx3,dx5^2-dx2*dx4],[x1,x2,x3,x4,x5]]
[1077] A= dsolv_starting_term(F[0],F[1],[1,1,1,1,0])$
Computing the initial ideal.
Done.
Computing a primary ideal decomposition.
Primary ideal decomposition of the initial Frobenius ideal
to the direction [1,1,1,1,0] is
[[[x5+2*x4+x3-1,x5+3*x4-x2-1,x5+2*x4+x1-1,3*x5^2+(8*x4-6)*x5-8*x4+3,
x5^2-2*x5-8*x4^2+1,x5^3-3*x5^2+3*x5-1],
[x5-1,x4,x3,x2,x1]]]

----- root is [ 0 0 0 0 1 ]
----- dual system is
[x5^2+(-3/4*x4-1/2*x3-1/4*x2-1/2*x1)*x5+1/8*x4^2
+(1/4*x3+1/4*x1)*x4+1/4*x2*x3-1/8*x2^2+1/4*x1*x2,
x4-2*x3+3*x2-2*x1,x5-x3+x2-x1,1]

[1078] A[0];
[[ 0 0 0 0 1 ]]
[1079] map(fctr,A[1][0]);
[[[1/8,1],[x5,1],[log(x2)+log(x4)-2*log(x5),1],
[2*log(x1)-log(x2)+2*log(x3)+log(x4)-4*log(x5),1]],
[[1,1],[x5,1],[-2*log(x1)+3*log(x2)-2*log(x3)+log(x4),1]],
[[1,1],[x5,1],[-log(x1)+log(x2)-log(x3)+log(x5),1]],
[[1,1],[x5,1]]]
```

# Index

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## Short Contents

|           |   |
|-----------|---|
| 1 DSOLV 醇 | 1 |
| Index     | 3 |

# Table of Contents

|              |                      |          |
|--------------|----------------------|----------|
| <b>1</b>     | <b>DSOLVE 醇</b>      | <b>1</b> |
| 1.1          | 醇 遺                  | 1        |
| 1.1.1        | dsolve_dual          | 1        |
| 1.1.2        | dsolve_starting_term | 1        |
| <b>Index</b> |                      | <b>3</b> |