

# Dsolv

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OpenXM.org

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# 1 DSOLV

```
. [SST] . load("dsolv.rr"); . Diff Dmodule .
OpenXM/Risa/Asir ,
    load("dsolv.rr");$
.
ox_sm1 . sm1 .
```

## 1.1

### 1.1.1 dsolv\_dual

```
dsolv_dual(f,v)
    :: f
```

$f, v$

- $v, f$  .
- $f, v$  , primary . primary , .

Algorithm: [SST] Algorithm 2.3.14 .  $x, y, \dots \log(x), \log(y), \dots, \log, f_-(x \rightarrow x \cdot dx, y \rightarrow y \cdot dy, \dots)$  .

```
[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)
    :: f w Starting terms . , v .
```

$f, v, w$

- $f$  w Starting terms . ,  $v$  .
- :  $[[e1, e2, \dots], [s1, s2, \dots]]$   $e1$  exponent  $s1$  , .
- `Dsolv_message_starting_term 1 , .`

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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