

```

> restart:

with(PDEtools, casesplit, declare):
with(DEtools, gensys):

with(DifferentialGeometry):

with(JetCalculus):
with(LieAlgebras):
with(GroupActions):

DGsetup([x,y,z,u], Rquatre):      Repere_xyzu := evalDG([D_x,
D_y,D_z,D_u]);

FF := sort(expand(
y^2*z^5+y^2*z^4+y^2*z^3+y^2*z^2+y^2*z+x^2+y^2
), [z,y,x], ascending);

```

$$\begin{aligned}
 \text{Repere_xyzu} &:= [\partial_x, \partial_y, \partial_z, \partial_u] \\
 FF &:= x^2 + y^2 + z y^2 + z^2 y^2 + z^3 y^2 + z^4 y^2 + z^5 y^2
 \end{aligned} \tag{1}$$

```

> e[1] := evalDG(D_x+0*D_y+0*D_z+2*x*D_u);
e[2] := evalDG(0*D_x-(-1+z)*D_y+0*D_z+2*y*D_u);
e[3] := evalDG(0*D_x-(1/2)*y*D_y-(-1+z)*D_z+0*D_u);

e[4] := evalDG(x*D_x+y*D_y+0*D_z+2*u*D_u);

```

$$\begin{aligned}
 e_1 &:= \partial_x + 2x\partial_u \\
 e_2 &:= -(-1+z)\partial_y + 2y\partial_u \\
 e_3 &:= -\frac{y}{2}\partial_y - (-1+z)\partial_z \\
 e_4 &:= x\partial_x + y\partial_y + 2u\partial_u
 \end{aligned} \tag{2}$$

```
> algebre_lie := LieAlgebraData([seq(e[i], i=1..4)]);
```

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  DGsetup(algebre_lie):
```

```
  LD := LeviDecomposition();
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  resolvable := Query("Solvable");
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```
  semi_simple := Query("Semisimple");
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```
  MultiplicationTable("LieTable");
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$algebre_lie := [e1, e2] = 0, [e1, e3] = 0, [e1, e4] = e1, [e2, e3] = \frac{1}{2} e2, [e2, e4] = e2, [e3, e4] = 0$

$LD := [[e1, e2, e3, e4], []]$

$resolvable := true$

$semi_simple := false$

L1	$e1$	$e2$	$e3$	$e4$
$e1$	0	0	0	$e1$
$e2$	0	$0 \frac{1}{2} e2$	$e2$	$e2$
$e3$	$0 - \frac{1}{2} e2$	0	0	0
$e4$	$-e1$	$-e2$	0	0

(3)