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> 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);

```

$$Repere_xyzu := [\partial_x, \partial_y, \partial_z, \partial_u]$$

$$FF := x^2 + y^2 + z y^2 + z^2 y^2 + z^3 y^2 + z^4 y^2 + z^5 y^2 \quad (1)$$

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> x^2*z^5+x^2*z^4+x^2*z^3+x^2*z^2+x^2*z+x^2+y^2;
x^2 z^5 + x^2 z^4 + x^2 z^3 + x^2 z^2 + x^2 z + x^2 + y^2 \quad (2)

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

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

```

$$e_1 := -(z-1) \partial_x + 2x \partial_u$$

$$e_2 := \partial_y + 2y \partial_u$$

$$e_3 := \frac{y}{2} \partial_y - (z-1) \partial_z + u \partial_u$$

$$e_4 := x \partial_x + y \partial_y + 2u \partial_u \quad (3)$$

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> algebre_lie := LieAlgebraData([seq(e[i], i=1..4)]);
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  DGsetup(algebre_lie):
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  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 := $[e1, e2] = 0, [e1, e3] = e1, [e1, e4] = e1, [e2, e3] = \frac{1}{2} e2, [e2, e4]$
 $] = e2, [e3, e4] = 0$

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

resolvable := true

semi_simple := false

L1	<i>e1</i>	<i>e2</i>	<i>e3</i>	<i>e4</i>
<i>e1</i>	0	0	<i>e1</i>	<i>e1</i>
<i>e2</i>	0	0	$\frac{1}{2} e2$	<i>e2</i>
<i>e3</i>	$-e1$	$-\frac{1}{2} e2$	0	0
<i>e4</i>	$-e1$	$-e2$	0	0

(4)