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> restart :
> with(DifferentialGeometry) :
> with(Tools) : with(LinearAlgebra) :
> DGsetup([z, y, u[1], u[2]], [a], M, verbose);
    The following coordinates have been protected:
            [z, y, u1, u2, a]
    The following vector fields have been defined and protected:
            [Dz, Dy, Du1, Du2, Da]
    The following differential 1-forms have been defined and protected:
            [dz, dy, du1, du2, da]
            frame name: M

```

(1)

```

> g := Matrix([[a3, 0, 0, 0], [0, a2, 0, 0], [0, 0, a, 0], [0, 0, 0, a]]);
            g :=
            [
            [ a3  0  0  0 ]
            [  0  a2  0  0 ]
            [  0  0  a  0 ]
            [  0  0  0  a ]
            ]

```

(2)

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M > h := MatrixInverse(g) :
M > A := map(evalDG, (ExteriorDerivative(g).h));
            A :=
            [
            [ 3 da / a  0 dz  0 dz  0 dz ]
            [ 0 dz  2 da / a  0 dz  0 dz ]
            [ 0 dz  0 dz  da / a  0 dz ]
            [ 0 dz  0 dz  0 dz  da / a ]
            ]

```

(3)

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M > t[1] := da / a;
            t1 := da / a

```

(4)

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M > t[8] := 1/4 Iy2 dz - 1/4 Iz2 dy + (-1/2 z - 1/2 y) du1 + 1/4 du2 :

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M > t[9] := -1/2 Iy dz + 1/2 Iz dy + 1/2 du1 :

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M > V := Vector([t[8], t[9], dz, dy]) :

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M > W := g.V :

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M > FD := FrameData([t[1], W[1], W[2], W[3], W[4]], N) :

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M > DGsetup(FD, [E], [alpha[1], sigma, rho, zeta, ζ#], verbose);

```

*The following coordinates have been protected:*

$$[z, y, u_1, u_2, a]$$

The following vector fields have been defined and protected:

$$[E1, E2, E3, E4, E5]$$

The following differential 1-forms have been defined and protected:

$$[\alpha_1, \sigma, \rho, \zeta, \zeta^\#]$$

frame name: N

(5)

**M** > ExteriorDerivative(sigma);

$$3 \alpha_1 \wedge \sigma + \rho \wedge \zeta + \rho \wedge \zeta^\#$$

(6)

**N** > ExteriorDerivative(rho);

$$2 \alpha_1 \wedge \rho + I \zeta \wedge \zeta^\#$$

(7)

**N** > ExteriorDerivative(zeta);

$$\alpha_1 \wedge \zeta$$

(8)

**N** > ExteriorDerivative( $\zeta^\#$ );

$$\alpha_1 \wedge \zeta^\#$$

(9)

**N** > ExteriorDerivative(alpha[1]);

$$0 \alpha_1 \wedge \sigma$$

(10)

**N** >