> $restart:$

> $with(DifferentialGeometry):$

> $with(Tools): with(LinearAlgebra):$

> $DGsetup([z, y, u[1], u[2]],\ [a, d, e], M, verbose);$

The following coordinates have been protected:

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

The following vector fields have been defined and protected:

$$[D\_z, D\_y, D\_u_1, D\_u_2, D\_a, D\_d, D\_e]$$

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

$$[dz, dy, du_1, du_2, da, dd, de]$$

frame name: M **(1)**

> $g := Matrix([[a^3, 0, 0, 0], [0, a^2, 0, 0], [d, 0, a, 0], [e, 0, 0, a]]);$

$$g := \begin{bmatrix} a^3 & 0 & 0 & 0 \\ 0 & a^2 & 0 & 0 \\ d & 0 & a & 0 \\ e & 0 & 0 & a \end{bmatrix} \qquad \textbf{(2)}$$

> $h := MatrixInverse(g):$

> $A := map(evalDG, (ExteriorDerivative(g).h));$

$$A := \begin{bmatrix} \frac{3\,da}{a} & 0\,dz & 0\,dz & 0\,dz \\ 0\,dz & \frac{2\,da}{a} & 0\,dz & 0\,dz \\ -\frac{d\,da}{a^4} + \frac{dd}{a^3} & 0\,dz & \frac{da}{a} & 0\,dz \\ -\frac{e\,da}{a^4} + \frac{de}{a^3} & 0\,dz & 0\,dz & \frac{da}{a} \end{bmatrix} \qquad \textbf{(3)}$$

M > $t[1] := \frac{da}{a}:$

M > $t[2] := -\frac{d\,da}{a^4} + \frac{dd}{a^3}:$

M > $t[3] := -\frac{e\,da}{a^4} + \frac{de}{a^3}:$

M >

M > $t[8] := \frac{1}{4}\,\mathrm{I}\,y^2\,dz - \frac{1}{4}\,\mathrm{I}\,z^2\,dy + \left(-\frac{1}{2}\,z - \frac{1}{2}\,y\right)du_1 + \frac{1}{4}\,du_2:$

M > $t[9] := -\frac{1}{2}\,\mathrm{I}\,y\,dz + \frac{1}{2}\,\mathrm{I}\,z\,dy + \frac{1}{2}\,du_1:$

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

M > $W := g.V:$

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

M > $DGsetup\left(FD, [E], \left[\text{alpha}[1], \text{alpha}[2], \text{alpha}[3], \text{ sigma, rho, zeta}, \zeta^{\#}\right], verbose\right)$;

The following coordinates have been protected:

$$\left[z, y, u_1, u_2, a, d, e\right]$$

The following vector fields have been defined and protected:

$$[E1, E2, E3, E4, E5, E6, E7]$$

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

$$\left[\alpha_1, \alpha_2, \alpha_3, \sigma, \rho, \zeta, \zeta^{\#}\right]$$

frame name: N **(4)**

N > $ExteriorDerivative(\text{sigma})$;

$$3\,\alpha_1 \wedge \sigma + \frac{(d+e)\,\sigma \wedge \rho}{a^3} + \rho \wedge \zeta + \rho \wedge \zeta^{\#} \tag{5}$$

N > $ExteriorDerivative(\text{rho})$;

$$2\,\alpha_1 \wedge \rho + \frac{\mathrm{I}\,e\,\sigma \wedge \zeta}{a^3} - \frac{\mathrm{I}\,d\,\sigma \wedge \zeta^{\#}}{a^3} + \mathrm{I}\,\zeta \wedge \zeta^{\#} \tag{6}$$

N > $ExteriorDerivative(\text{zeta})$;

$$\alpha_1 \wedge \zeta + \alpha_2 \wedge \sigma + \frac{d\,(d+e)\,\sigma \wedge \rho}{a^6} + \frac{d\,\rho \wedge \zeta}{a^3} + \frac{d\,\rho \wedge \zeta^{\#}}{a^3} \tag{7}$$

N > $ExteriorDerivative\left(\zeta^{\#}\right)$;

$$\alpha_1 \wedge \zeta^{\#} + \alpha_3 \wedge \sigma + \frac{e\,(d+e)\,\sigma \wedge \rho}{a^6} + \frac{e\,\rho \wedge \zeta}{a^3} + \frac{e\,\rho \wedge \zeta^{\#}}{a^3} \tag{8}$$

N >