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> restart :
> with(DifferentialGeometry) :
> with(Tools) : with(LinearAlgebra) :
> DGsetup([w, x, y, z, z1], [a, b, b1, c, d, e, f, g, h, k], frame1, verbose) :
    The following coordinates have been protected:
        [w, x, y, z, z1, a, b, b1, c, d, e, f, g, h, k]
    The following vector fields have been defined and protected:
[D_w, D_x, D_y, D_z, D_z1, D_a, D_b, D_b1, D_c, D_d, D_e, D_f, D_g, D_h, D_k]
    The following differential 1-forms have been defined and protected:
        [dw, dx, dy, dz, dz1, da, db, db1, dc, dd, de, df, dg, dh, dk]

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(1)

Par rapport à la session précédente, $a := a*B^{(1/2)}$, $f:=f*B$, $g:=g*B$, $c:=c*B^{(1/2)}$, $d:=d*B^{(1/2)}$ et $e:=e*B^{(1/2)}$, $h:=h*B$, $k:=k*B$.

Une procédure de dérivation:

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> Der := proc(x) local y; y := op(1, x) : if (type(x, `+`) = true) then add(Der(op(i, x)), i = 1
.. nops(x)) elif
    (type(x, `*`) = true) then expand( (x/y) * Der(y) + y * Der(x/y) ) elif
    (type(x, `^`) = true) then op(2, x) * y^(op(2, x) - 1) * Der(y) elif
    ((type(x, function) = true) or (type(x, symbol) = true)) then R(x) * W[1]
+ S(x) * W[2] + Tau(x) * W[3] + L(x) * W[4] + L#(x) * W[5]
    else 0 fi end proc:

```

On exprime le nouveau coframe initial (chapeau) en fonction du premier.

W représente le premier coframe initial et V représente le nouveau coframe initial (chapeau). On a la relation $V:=m.W$.

```

frame1 > m := Matrix( [[ [B^-1, 0, 0, 0, 0], [0, B^-1/2, 0, 0, 0], [0, 0, 1, 0, 0], [0, 0, 0,
B^-1/2, 0], [0, 0, 0, 0, B^1/2] ] ] ) :

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> minv := MatrixInverse(m) :

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M > W := minv.Vector([V[1], V[2], V[3], V[4], V[5]]) :

```

On donne ensuite la matrice de groupe:

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frame1 > Ma := Matrix( [[ [a^4, 0, 0, 0, 0], [f, a^3, 0, 0, 0], [g, c, a^2, 0, 0], [h, d, b, a,
0], [k, e, b1, 0, a] ] ] ) :

```

$$Ma := \begin{bmatrix} a^4 & 0 & 0 & 0 & 0 \\ f & a^3 & 0 & 0 & 0 \\ g & c & a^2 & 0 & 0 \\ h & d & b & a & 0 \\ k & e & b1 & 0 & a \end{bmatrix}$$

(2)

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frame1 > MaInv := MatrixInverse(Ma) :

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Les formes de Maurer Cartan ont été calculées dans le cas du modèle :

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> t[1] :=  $\frac{da}{a}$  :
M > t[2] :=  $-\frac{b da}{a^3} + \frac{db}{a^2}$  :
M > t[3] :=  $-\frac{2 c da}{a^4} + \frac{dc}{a^3}$  :
M > t[4] :=  $-\frac{(d a^2 - b c) da}{a^6} - \frac{c db}{a^5} + \frac{dd}{a^3}$  :
M > t[5] :=  $-\frac{(e a^2 - b l c) da}{a^6} - \frac{c db l}{a^5} + \frac{de}{a^3}$  :
M > t[6] :=  $-\frac{3 f da}{a^5} + \frac{df}{a^4}$  :
M > t[7] :=  $-\frac{2 (g a^3 - c f) da}{a^8} - \frac{f dc}{a^7} + \frac{dg}{a^4}$  :
M > t[8] :=  $-\frac{(h a^5 - d f a^2 - b g a^3 + b c f) da}{a^{10}} - \frac{(g a^3 - c f) db}{a^9} - \frac{f dd}{a^7} + \frac{dh}{a^4}$  :
M > t[9] :=  $-\frac{(k a^5 - e f a^2 - b l g a^3 + b l c f) da}{a^{10}} - \frac{(g a^3 - c f) db l}{a^9} - \frac{f de}{a^7} + \frac{dk}{a^4}$  :
M > t[10] :=  $-\frac{b l da}{a^3} + \frac{db l}{a^2}$  :
frame1 > FD := FrameData([t[1], t[2], t[3], t[4], t[5], t[6], t[7], t[8], t[9],
t[10], dw, dx, dy, dz, dz1], frame2) :
frame1 > DGsetup(FD, [E], [alpha[1], alpha[2], alpha[3], alpha[4], alpha[5],
alpha[6], alpha[7], alpha[8], alpha[9],  $\alpha^{\#}[2]$ , tau, sigma, rho, zeta,
 $\zeta^{\#}$ ], verbose);
The following coordinates have been protected:
[w, x, y, z, z1, a, b, b1, c, d, e, f, g, h, k]
The following vector fields have been defined and protected:
[E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13, E14, E15]
The following differential 1-forms have been defined and protected:
[ $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8, \alpha_9, \alpha_2^{\#}, \tau, \sigma, \rho, \zeta, \zeta^{\#}$ ]
frame name: frame2
frame2 > Y := Vector([tau, sigma, rho, zeta,  $\zeta^{\#}$ ]) :
frame2 > V := MaInv.Y :
Les equations de courbure sur les W[i] sont connues:
frame2 > dW[1] := T·(W[1]&wedge W[2]) + Q·(W[1]&wedge W[3]) + K
·(W[1]&wedge W[5]) + G·(W[1] &wedge W[4]) + N·(W[2]
&wedge W[3]) + B·(W[2] &wedge W[5]) + (W[2]
&wedge W[4]) :
frame2 > dW[2] := S·(W[1]&wedge W[2]) + P·(W[1]&wedge W[3]) + J
·(W[1]&wedge W[5]) + F·(W[1] &wedge W[4]) + M·(W[2]

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(3)

$\&wedge W[3]) + (L(B) + A) \cdot (W[2] \&wedge W[5]) + B \cdot (W[3] \&wedge W[5]) + (W[3] \&wedge W[4]) :$

frame2 > $dW[3] := R \cdot (W[1] \&wedge W[2]) + O \cdot (W[1] \&wedge W[3]) + H \cdot (W[1] \&wedge W[5]) + E \cdot (W[1] \&wedge W[4]) + LL \cdot (W[2] \&wedge W[3]) + L(A) \cdot (W[2] \&wedge W[5]) + A \cdot (W[3] \&wedge W[5]) + I \cdot (W[4] \&wedge W[5]) :$

On en deduit les nouvelles courbures initiales:

frame2 > $dV[1] := evalDG(B^{-1} \cdot dW[1] + (Der(B^{-1}) \&wedge W[1])) :$

frame2 > $dV[2] := evalDG\left(B^{-\frac{1}{2}} \cdot dW[2] + \left(Der\left(B^{-\frac{1}{2}}\right) \&wedge W[2]\right)\right) :$

frame2 > $dV[3] := dW[3] :$

frame2 > $dV[4] := Der\left(B^{-\frac{1}{2}}\right) \&wedge W[4] :$

frame2 > $dV[5] := Der\left(B^{\frac{1}{2}}\right) \&wedge W[5] :$

On peut maintenant calculer les équations de courbure du coframe 'relevé':

frame2 > $dV := Vector([dV[1], dV[2], dV[3], dV[4], dV[5]]) :$

frame2 > $\Omega := map(evalDG, Ma.dV) :$

frame2 > $Mat := map(evalDG, (ExteriorDerivative(Ma).MaInv)) :$

frame2 > $Mat2 := Mat \&MatrixWedge Y :$

frame2 > $SE := map(evalDG, (Mat2 \&MatrixPlus \Omega)) :$

frame2 > $List := GenerateForms([\alpha[1], \alpha[2], \alpha[3], \alpha[4], \alpha[5], \alpha[6], \alpha[7], \alpha[8], \alpha[9], \alpha^{\#}[2], \tau, \sigma, \rho, \zeta, \zeta^{\#}], 2) :$

frame2 > $Torsion := \mathbf{proc}(S, i, j) \mathbf{local} k, X; k := 15 \cdot (i - 1) - \frac{i \cdot (i - 1)}{2} + j - i; X := GetComponents(S, List); \mathbf{expand}(X[k]); \mathbf{end} \mathbf{proc} :$

frame2 > $\mathbf{result} := \mathbf{proc}(l) \mathbf{local} k, t, X; X := 0 : t := \mathbf{expand}(GetComponents(l, List)) : \mathbf{for} k \mathbf{from} 1 \mathbf{to} 105 \mathbf{do} X := X + t[k] \cdot List[k] \mathbf{od}; X; \mathbf{end} \mathbf{proc} :$

frame2 > $\mathbf{result}(SE[1]) ;$

$$\begin{aligned}
& 4 \alpha_1 \wedge \tau + \left(-\frac{L^{\#}(B) e}{a^4 B^{3/2}} + \frac{L^{\#}(B) b l c}{a^6 B^{3/2}} - \frac{L(B) d}{a^4 \sqrt{B}} + \frac{L(B) b c}{a^6 \sqrt{B}} - \frac{T(B) c}{a^5 B} + \frac{S(B)}{a^3 \sqrt{B}} + \frac{h}{a^4} \right. \\
& - \frac{g b}{a^6} + \frac{k}{a^4} - \frac{g b l}{a^6} + \frac{N g}{a^5 \sqrt{B}} - \frac{\sqrt{B} G d}{a^4} + \frac{\sqrt{B} G b c}{a^6} - \frac{K e}{a^4 \sqrt{B}} + \frac{K b l c}{a^6 \sqrt{B}} \\
& \left. - \frac{Q c}{a^5} + \frac{\sqrt{B} T}{a^3} \right) \tau \wedge \sigma + \left(-\frac{L^{\#}(B) b l}{a^3 B^{3/2}} - \frac{L(B) b}{a^3 \sqrt{B}} + \frac{T(B)}{a^2 B} + \frac{f b}{a^6} + \frac{b l f}{a^6} \right. \\
& \left. - \frac{N f}{a^5 \sqrt{B}} - \frac{\sqrt{B} G b}{a^3} - \frac{K b l}{a^3 \sqrt{B}} + \frac{Q}{a^2} \right) \tau \wedge \rho + \left(\frac{L(B)}{a \sqrt{B}} - \frac{f}{a^4} + \frac{\sqrt{B} G}{a} \right) \tau \wedge \zeta \\
& + \left(\frac{L^{\#}(B)}{a B^{3/2}} - \frac{f}{a^4} + \frac{K}{a \sqrt{B}} \right) \tau \wedge \zeta^{\#} + \left(-\frac{b}{a^2} - \frac{b l}{a^2} + \frac{N}{a \sqrt{B}} \right) \sigma \wedge \rho + \sigma \wedge \zeta
\end{aligned} \tag{4}$$

$$+ \sigma \wedge \zeta^\#$$

frame2 > result(SE[2]);

$$\begin{aligned}
& 3 \alpha_1 \wedge \sigma + \alpha_6 \wedge \tau + \left(\frac{g e}{a^7} + \frac{g d}{a^7} - \frac{c k}{a^7} - \frac{L^\#(B) e f}{B^{3/2} a^8} - \frac{g b l f}{a^{10}} + \frac{g N f}{\sqrt{B} a^9} + \frac{1}{2} \frac{L^\#(B) k}{B^{3/2} a^5} \right. \\
& - \frac{\sqrt{B} c P}{a^6} + \frac{c J b l}{a^7} + \frac{B c F b}{a^7} - \frac{1}{2} \frac{L^\#(B) b l g}{B^{3/2} a^7} + \frac{L^\#(B) b l c f}{B^{3/2} a^{10}} - \frac{g f b}{a^{10}} - \frac{c h}{a^7} \\
& + \frac{B S}{a^4} - \frac{1}{2} \frac{R(B)}{a^4} + \frac{\sqrt{B} f T}{a^7} + \frac{1}{2} \frac{L(B) h}{\sqrt{B} a^5} + \frac{f k}{a^8} + \frac{f h}{a^8} - \frac{J e}{a^5} - \frac{B F d}{a^5} + \frac{M g}{a^6} \\
& + \frac{L(B) k}{\sqrt{B} a^5} + \frac{A k}{\sqrt{B} a^5} + \frac{S(B) f}{\sqrt{B} a^7} + \frac{1}{2} \frac{T(B) g}{B a^6} + \frac{f K b l c}{\sqrt{B} a^{10}} + \frac{\sqrt{B} f G b c}{a^{10}} - \frac{A g b l}{\sqrt{B} a^7} \\
& - \frac{L(B) g b l}{\sqrt{B} a^7} - \frac{f K e}{\sqrt{B} a^8} + \frac{L(B) b c f}{\sqrt{B} a^{10}} - \frac{\sqrt{B} f G d}{a^8} - \frac{L(B) d f}{\sqrt{B} a^8} - \frac{f Q c}{a^9} - \frac{T(B) c f}{B a^9} \\
& \left. - \frac{1}{2} \frac{L(B) b g}{\sqrt{B} a^7} \right) \tau \wedge \sigma + \left(-\frac{1}{2} \frac{f L^\#(B) b l}{B^{3/2} a^7} - \frac{1}{2} \frac{f L(B) b}{\sqrt{B} a^7} + \frac{1}{2} \frac{f T(B)}{B a^6} + \frac{h}{a^4} \right. \\
& - \frac{d f}{a^7} + \frac{k}{a^4} - \frac{e f}{a^7} + \frac{b l f L(B)}{\sqrt{B} a^7} + \frac{b l f A}{\sqrt{B} a^7} - \frac{M f}{a^6} - \frac{B F b}{a^4} - \frac{J b l}{a^4} + \frac{\sqrt{B} P}{a^3} \\
& + \left. \frac{f^2 b}{a^{10}} + \frac{b l f^2}{a^{10}} - \frac{N f^2}{\sqrt{B} a^9} - \frac{\sqrt{B} f G b}{a^7} - \frac{f K b l}{\sqrt{B} a^7} + \frac{f Q}{a^6} \right) \tau \wedge \rho + \left(\frac{1}{2} \frac{L(B) f}{\sqrt{B} a^5} \right. \\
& - \frac{g}{a^4} + \frac{c f}{a^7} + \frac{B F}{a^2} - \frac{f^2}{a^8} + \frac{\sqrt{B} f G}{a^5} \left. \right) \tau \wedge \zeta + \left(\frac{1}{2} \frac{L^\#(B) f}{B^{3/2} a^5} - \frac{g}{a^4} + \frac{c f}{a^7} - \frac{L(B) f}{\sqrt{B} a^5} \right. \\
& - \frac{f A}{\sqrt{B} a^5} + \frac{J}{a^2} - \frac{f^2}{a^8} + \frac{f K}{\sqrt{B} a^5} \left. \right) \tau \wedge \zeta^\# + \left(-\frac{1}{2} \frac{L^\#(B) b l}{a^3 B^{3/2}} - \frac{1}{2} \frac{L(B) b}{a^3 \sqrt{B}} \right. \\
& + \frac{1}{2} \frac{T(B)}{a^2 B} + \frac{d}{a^3} + \frac{e}{a^3} - \frac{b l L(B)}{\sqrt{B} a^3} - \frac{b l A}{\sqrt{B} a^3} + \frac{M}{a^2} - \frac{f b}{a^6} - \frac{b l f}{a^6} + \frac{N f}{a^5 \sqrt{B}} \left. \right) \\
& \sigma \wedge \rho + \left(\frac{1}{2} \frac{L(B)}{a \sqrt{B}} - \frac{c}{a^3} + \frac{f}{a^4} \right) \sigma \wedge \zeta + \left(\frac{1}{2} \frac{L^\#(B)}{a B^{3/2}} - \frac{c}{a^3} + \frac{L(B)}{a \sqrt{B}} + \frac{A}{a \sqrt{B}} \right. \\
& \left. + \frac{f}{a^4} \right) \sigma \wedge \zeta^\# + \rho \wedge \zeta + \rho \wedge \zeta^\#
\end{aligned} \tag{5}$$

frame2 > result(SE[3]);

$$\begin{aligned}
& 2 \alpha_1 \wedge \rho + \alpha_3 \wedge \sigma + \alpha_7 \wedge \tau + \left(-\frac{\sqrt{B} g G d}{a^8} + \frac{\sqrt{B} H b l c}{a^8} + \frac{B^{3/2} E b c}{a^8} - \frac{L(A) g b l}{a^8} \right. \\
& + \frac{A g e}{\sqrt{B} a^8} + \frac{B^{3/2} R}{a^5} - \frac{g K e}{\sqrt{B} a^8} - \frac{g Q c}{a^9} - \frac{g L(B) d}{\sqrt{B} a^8} - \frac{c J e}{a^8} - \frac{B c F d}{a^8} + \frac{c M g}{a^9} \\
& + \frac{c L(B) k}{\sqrt{B} a^8} - \frac{1}{2} \frac{c T(B) g}{B a^9} + \frac{c g d}{a^{10}} + \frac{1}{2} \frac{c L^\#(B) k}{B^{3/2} a^8} + \frac{1}{2} \frac{c L(B) h}{\sqrt{B} a^8} + \frac{I b c k}{a^9}
\end{aligned} \tag{6}$$

$$\begin{aligned}
& + \frac{I d b l g}{a^9} - \frac{I b g e}{a^9} - \frac{I h b l c}{a^9} - \frac{g L^\#(B) e}{B^{3/2} a^8} + \frac{J b l c^2}{a^{10}} + \frac{B F b c^2}{a^{10}} + \frac{c g e}{a^{10}} \\
& - \frac{B O c}{a^7} + \frac{L(A) k}{a^6} - \frac{\sqrt{B} H e}{a^6} - \frac{B^{3/2} E d}{a^6} + \frac{\sqrt{B} L L g}{a^7} + \frac{\sqrt{B} g G b c}{a^{10}} - \frac{c A g b l}{\sqrt{B} a^{10}} \\
& + \frac{g K b l c}{\sqrt{B} a^{10}} + \frac{1}{2} \frac{c L^\#(B) b l g}{B^{3/2} a^{10}} + \frac{1}{2} \frac{c L(B) b g}{\sqrt{B} a^{10}} - \frac{c L(B) g b l}{\sqrt{B} a^{10}} + \frac{I h e}{a^7} - \frac{I d k}{a^7} \\
& - \frac{g^2 b l}{a^{10}} - \frac{g^2 b}{a^{10}} - \frac{c^2 k}{a^{10}} - \frac{c^2 h}{a^{10}} + \frac{g k}{a^8} + \frac{g h}{a^8} + \frac{g S(B)}{\sqrt{B} a^7} + \frac{B c S}{a^7} - \frac{1}{2} \frac{c R(B)}{a^7} \\
& + \frac{\sqrt{B} g T}{a^7} + \frac{N g^2}{\sqrt{B} a^9} - \frac{\sqrt{B} P c^2}{a^9} \Big) \tau \wedge \sigma + \left(\frac{c k}{a^7} + \frac{g b l f}{a^{10}} - \frac{g N f}{\sqrt{B} a^9} + \frac{\sqrt{B} c P}{a^6} \right. \\
& - \frac{c J b l}{a^7} - \frac{B c F b}{a^7} - \frac{L^\#(B) b l g}{B^{3/2} a^7} + \frac{1}{2} \frac{L^\#(B) b l c f}{B^{3/2} a^{10}} + \frac{g f b}{a^{10}} + \frac{c h}{a^7} + \frac{A k}{\sqrt{B} a^5} \\
& + \frac{T(B) g}{B a^6} + \frac{B O}{a^4} + \frac{1}{2} \frac{L(B) b c f}{\sqrt{B} a^{10}} - \frac{1}{2} \frac{T(B) c f}{B a^9} - \frac{L(B) b g}{\sqrt{B} a^7} + \frac{I b e f}{a^9} - \frac{I b l d f}{a^9} \\
& + \frac{L(A) b l f}{a^8} - \frac{A e f}{\sqrt{B} a^8} - \frac{c e f}{a^{10}} - \frac{c d f}{a^{10}} - \frac{g K b l}{\sqrt{B} a^7} - \frac{\sqrt{B} g G b}{a^7} - \frac{c M f}{a^9} + \frac{c b l f A}{\sqrt{B} a^{10}} \\
& + \left. \frac{c b l f L(B)}{\sqrt{B} a^{10}} - \frac{I b k}{a^6} + \frac{I b l h}{a^6} - \frac{\sqrt{B} H b l}{a^5} - \frac{B^{3/2} E b}{a^5} - \frac{\sqrt{B} L L f}{a^7} + \frac{g Q}{a^6} \right) \tau \wedge \rho \\
& + \left(\frac{I k}{a^4} - \frac{I e f}{a^7} - \frac{I b l g}{a^6} + \frac{I b l c f}{a^9} + \frac{B^{3/2} E}{a^3} - \frac{1}{2} \frac{c L(B) f}{\sqrt{B} a^8} - \frac{c g}{a^7} + \frac{c^2 f}{a^{10}} + \frac{B c F}{a^5} \right. \\
& + \left. \frac{g L(B)}{\sqrt{B} a^5} - \frac{g f}{a^8} + \frac{\sqrt{B} g G}{a^5} \right) \tau \wedge \zeta + \left(\frac{I d f}{a^7} - \frac{I b c f}{a^9} + \frac{I b g}{a^6} - \frac{I h}{a^4} - \frac{A g}{\sqrt{B} a^5} \right. \\
& - \frac{L(A) f}{a^6} + \frac{\sqrt{B} H}{a^3} - \frac{1}{2} \frac{c L^\#(B) f}{B^{3/2} a^8} - \frac{c g}{a^7} + \frac{c^2 f}{a^{10}} - \frac{c L(B) f}{\sqrt{B} a^8} + \frac{c J}{a^5} + \frac{g L^\#(B)}{B^{3/2} a^5} \\
& - \left. \frac{g f}{a^8} + \frac{g K}{\sqrt{B} a^5} \right) \tau \wedge \zeta^\# + \left(\frac{I b l d}{a^5} - \frac{I b e}{a^5} + \frac{A e}{\sqrt{B} a^4} - \frac{L(A) b l}{a^4} + \frac{\sqrt{B} L L}{a^3} \right. \\
& - \frac{1}{2} \frac{L^\#(B) b l c}{a^6 B^{3/2}} - \frac{1}{2} \frac{L(B) b c}{a^6 \sqrt{B}} + \frac{1}{2} \frac{T(B) c}{a^5 B} + \frac{c d}{a^6} + \frac{c e}{a^6} - \frac{c b l L(B)}{\sqrt{B} a^6} \\
& - \left. \frac{c b l A}{\sqrt{B} a^6} + \frac{c M}{a^5} - \frac{g b}{a^6} - \frac{g b l}{a^6} + \frac{N g}{a^5 \sqrt{B}} \right) \sigma \wedge \rho + \left(\frac{I e}{a^3} - \frac{I b l c}{a^5} + \frac{1}{2} \frac{c L(B)}{\sqrt{B} a^4} \right. \\
& - \left. \frac{c^2}{a^6} + \frac{g}{a^4} \right) \sigma \wedge \zeta + \left(-\frac{I d}{a^3} + \frac{I b c}{a^5} + \frac{L(A)}{a^2} + \frac{1}{2} \frac{c L^\#(B)}{B^{3/2} a^4} - \frac{c^2}{a^6} + \frac{c L(B)}{\sqrt{B} a^4} \right. \\
& + \left. \frac{g}{a^4} \right) \sigma \wedge \zeta^\# + \left(\frac{I b l}{a^2} + \frac{c}{a^3} \right) \rho \wedge \zeta + \left(-\frac{I b}{a^2} + \frac{A}{a \sqrt{B}} + \frac{c}{a^3} \right) \rho \wedge \zeta^\# + I \zeta \wedge \zeta^\#
\end{aligned}$$

frame2 > result(SE[4]);

$$\begin{aligned}
& \alpha_1 \wedge \zeta + \alpha_2 \wedge \rho + \alpha_4 \wedge \sigma + \alpha_8 \wedge \tau + \left(-\frac{dAgbl}{a^{10}\sqrt{B}} + \frac{\sqrt{B}hGbc}{a^{10}} + \frac{hKblc}{a^{10}\sqrt{B}} - \frac{bAck}{a^{10}\sqrt{B}} \right. \\
& + \frac{bAge}{a^{10}\sqrt{B}} - \frac{bL(A)gbl}{a^{10}} - \frac{1}{2} \frac{dL(B)bg}{a^{10}\sqrt{B}} + \frac{BdFbc}{a^{10}} + \frac{dJblc}{a^{10}} + \frac{hL(B)bc}{a^{10}\sqrt{B}} \\
& - \frac{L(B)dblg}{a^{10}\sqrt{B}} + \frac{1}{2} \frac{L^\#(B)blch}{a^{10}B^{3/2}} - \frac{1}{2} \frac{L^\#(B)ebg}{a^{10}B^{3/2}} + \frac{1}{2} \frac{L^\#(B)kbc}{a^{10}B^{3/2}} + \frac{Ibdblg}{a^{11}} \\
& - \frac{Ibhblc}{a^{11}} + \frac{\sqrt{B}bHblc}{a^{10}} + \frac{\sqrt{B}bLLg}{a^9} - \frac{B^{3/2}bEd}{a^8} + \frac{B^{3/2}b^2Ec}{a^{10}} - \frac{\sqrt{B}bHe}{a^8} \\
& + \frac{L(B)dk}{a^8\sqrt{B}} + \frac{egd}{a^{10}} + \frac{dAk}{a^8\sqrt{B}} - \frac{\sqrt{B}dPc}{a^9} + \frac{hNg}{a^9\sqrt{B}} - \frac{\sqrt{B}hGd}{a^8} - \frac{hKe}{a^8\sqrt{B}} \\
& + \frac{bL(A)k}{a^8} - \frac{BbOc}{a^9} - \frac{dch}{a^{10}} - \frac{dck}{a^{10}} - \frac{hgb}{a^{10}} - \frac{hgb}{a^{10}} - \frac{1}{2} \frac{T(B)ch}{a^9B} \\
& - \frac{1}{2} \frac{dL(B)h}{a^8\sqrt{B}} + \frac{dMg}{a^9} - \frac{dJe}{a^8} - \frac{hQc}{a^9} - \frac{1}{2} \frac{L^\#(B)eh}{a^8B^{3/2}} + \frac{1}{2} \frac{S(B)bg}{a^9\sqrt{B}} \\
& - \frac{1}{2} \frac{R(B)bc}{a^9} - \frac{Ibdk}{a^9} + \frac{Ibhe}{a^9} + \frac{Ib^2ck}{a^{11}} - \frac{Ib^2ge}{a^{11}} + \frac{kh}{a^8} + \frac{B^{3/2}bR}{a^7} \\
& + \frac{\sqrt{B}hT}{a^7} + \frac{1}{2} \frac{S(B)h}{a^7\sqrt{B}} - \frac{BFd^2}{a^8} + \frac{BdS}{a^7} + \frac{gd^2}{a^{10}} + \frac{h^2}{a^8} \Big) \tau \wedge \sigma + \left(\frac{blL(B)df}{a^{10}\sqrt{B}} \right. \\
& + \frac{1}{2} \frac{bL^\#(B)ef}{a^{10}B^{3/2}} + \frac{dblfA}{a^{10}\sqrt{B}} - \frac{bAef}{a^{10}\sqrt{B}} + \frac{bL(A)blf}{a^{10}} + \frac{1}{2} \frac{dfL(B)b}{a^{10}\sqrt{B}} - \frac{Ibbl df}{a^{11}} \\
& + \frac{1}{2} \frac{bR(B)}{a^6} + \frac{\sqrt{B}dP}{a^6} + \frac{BbO}{a^6} + \frac{dh}{a^7} - \frac{d^2f}{a^{10}} + \frac{dk}{a^7} + \frac{1}{2} \frac{T(B)h}{a^6B} + \frac{hQ}{a^6} \\
& - \frac{B^{3/2}b^2E}{a^7} - \frac{Ib^2k}{a^8} - \frac{edf}{a^{10}} - \frac{1}{2} \frac{bL^\#(B)k}{a^7B^{3/2}} - \frac{1}{2} \frac{L^\#(B)blh}{a^7B^{3/2}} - \frac{hNf}{a^9\sqrt{B}} \\
& - \frac{\sqrt{B}hGb}{a^7} - \frac{hKbl}{a^7\sqrt{B}} + \frac{bAk}{a^7\sqrt{B}} - \frac{dMf}{a^9} - \frac{BdFb}{a^7} - \frac{dJbl}{a^7} - \frac{hL(B)b}{a^7\sqrt{B}} \\
& + \frac{hfb}{a^{10}} + \frac{hblf}{a^{10}} - \frac{1}{2} \frac{bS(B)f}{a^9\sqrt{B}} - \frac{\sqrt{B}bLLf}{a^9} - \frac{\sqrt{B}bHbl}{a^7} + \frac{Ib^2ef}{a^{11}} \\
& + \frac{Ibblh}{a^8} \Big) \tau \wedge \rho + \left(\frac{1}{2} \frac{L^\#(B)k}{B^{3/2}a^5} - \frac{1}{2} \frac{L^\#(B)ef}{B^{3/2}a^8} - \frac{1}{2} \frac{L^\#(B)blg}{B^{3/2}a^7} \right. \\
& + \frac{1}{2} \frac{L^\#(B)blcf}{B^{3/2}a^{10}} + \frac{1}{2} \frac{T(B)g}{Ba^6} - \frac{1}{2} \frac{T(B)cf}{Ba^9} + \frac{1}{2} \frac{S(B)f}{\sqrt{B}a^7} - \frac{1}{2} \frac{R(B)}{a^4} - \frac{Ibef}{a^9} \\
& - \frac{Iblbg}{a^8} + \frac{Ibk}{a^6} + \frac{Iblbcf}{a^{11}} + \frac{B^{3/2}Eb}{a^5} - \frac{1}{2} \frac{L(B)df}{\sqrt{B}a^8} - \frac{gd}{a^7} + \frac{cdf}{a^{10}} + \frac{BFd}{a^5}
\end{aligned} \tag{7}$$

$$\begin{aligned}
& + \frac{L(B)h}{\sqrt{B}a^5} - \frac{fh}{a^8} + \frac{\sqrt{B}hG}{a^5} \Big) \tau \wedge \zeta + \left(\frac{1}{2} \frac{hL^\#(B)}{a^5 B^{3/2}} + \frac{1}{2} \frac{L^\#(B)bg}{a^7 B^{3/2}} \right. \\
& - \frac{1}{2} \frac{L^\#(B)bcf}{a^{10} B^{3/2}} - \frac{Ibh}{a^6} + \frac{Ibdf}{a^9} + \frac{Ib^2g}{a^8} - \frac{Ib^2cf}{a^{11}} - \frac{bAg}{a^7 \sqrt{B}} + \frac{bAcf}{a^{10} \sqrt{B}} \\
& - \frac{bL(A)f}{a^8} + \frac{\sqrt{B}bH}{a^5} - \frac{gd}{a^7} + \frac{cdf}{a^{10}} - \frac{L(B)df}{\sqrt{B}a^8} - \frac{dfA}{a^8 \sqrt{B}} + \frac{dJ}{a^5} - \frac{fh}{a^8} \\
& \left. + \frac{hK}{a^5 \sqrt{B}} \right) \tau \wedge \zeta^\# + \left(-\frac{1}{2} \frac{bL^\#(B)e}{a^6 B^{3/2}} + \frac{1}{2} \frac{bS(B)}{a^5 \sqrt{B}} + \frac{Ibbld}{a^7} - \frac{Ib^2e}{a^7} + \frac{bAe}{a^6 \sqrt{B}} \right. \\
& - \frac{bL(A)bl}{a^6} + \frac{\sqrt{B}bLL}{a^5} - \frac{1}{2} \frac{dL(B)b}{a^6 \sqrt{B}} + \frac{d^2}{a^6} + \frac{ed}{a^6} - \frac{blL(B)d}{a^6 \sqrt{B}} - \frac{dblA}{a^6 \sqrt{B}} \\
& \left. + \frac{dM}{a^5} - \frac{bh}{a^6} - \frac{hbl}{a^6} + \frac{hN}{a^5 \sqrt{B}} \right) \sigma \wedge \rho + \left(\frac{1}{2} \frac{L^\#(B)e}{a^4 B^{3/2}} - \frac{1}{2} \frac{L^\#(B)blc}{a^6 B^{3/2}} \right. \\
& \left. + \frac{1}{2} \frac{T(B)c}{a^5 B} - \frac{1}{2} \frac{S(B)}{a^3 \sqrt{B}} + \frac{Ibe}{a^5} - \frac{Iblbc}{a^7} + \frac{1}{2} \frac{L(B)d}{a^4 \sqrt{B}} - \frac{cd}{a^6} + \frac{h}{a^4} \right) \sigma \wedge \zeta \\
& + \left(\frac{1}{2} \frac{L^\#(B)bc}{a^6 B^{3/2}} - \frac{Ibd}{a^5} + \frac{Ib^2c}{a^7} - \frac{bAc}{a^6 \sqrt{B}} + \frac{bL(A)}{a^4} - \frac{cd}{a^6} + \frac{L(B)d}{a^4 \sqrt{B}} \right. \\
& \left. + \frac{dA}{a^4 \sqrt{B}} + \frac{h}{a^4} \right) \sigma \wedge \zeta^\# + \left(\frac{1}{2} \frac{L^\#(B)bl}{a^3 B^{3/2}} - \frac{1}{2} \frac{T(B)}{a^2 B} + \frac{Iblb}{a^4} + \frac{d}{a^3} \right) \rho \wedge \zeta + \left(\right. \\
& \left. - \frac{1}{2} \frac{L^\#(B)b}{a^3 B^{3/2}} - \frac{Ib^2}{a^4} + \frac{bA}{a^3 \sqrt{B}} + \frac{d}{a^3} \right) \rho \wedge \zeta^\# + \left(\frac{1}{2} \frac{L^\#(B)}{a B^{3/2}} + \frac{Ib}{a^2} \right) \zeta \wedge \zeta^\#
\end{aligned}$$

frame2 > result(SE[5]);

$$\begin{aligned}
& \alpha_1 \wedge \zeta^\# + \alpha_5 \wedge \sigma + \alpha_9 \wedge \tau + \alpha_2^\# \wedge \rho + \left(\frac{k^2}{a^8} + \frac{1}{2} \frac{L(B)dblg}{a^{10} \sqrt{B}} - \frac{3}{2} \frac{L(B)dk}{a^8 \sqrt{B}} + \frac{egd}{a^{10}} \right. \\
& + \frac{B^{3/2}blR}{a^7} + \frac{\sqrt{B}kT}{a^7} + \frac{BeS}{a^7} + \frac{3}{2} \frac{S(B)k}{a^7 \sqrt{B}} - \frac{R(B)e}{a^7} + \frac{ge^2}{a^{10}} - \frac{Je^2}{a^8} + \frac{kh}{a^8} \\
& - \frac{1}{2} \frac{S(B)blg}{a^9 \sqrt{B}} + \frac{1}{2} \frac{R(B)blc}{a^9} + \frac{eAk}{a^8 \sqrt{B}} - \frac{\sqrt{B}ePc}{a^9} + \frac{kNg}{a^9 \sqrt{B}} - \frac{\sqrt{B}kGd}{a^8} \\
& - \frac{kKe}{a^8 \sqrt{B}} + \frac{blL(A)k}{a^8} - \frac{bl^2L(A)g}{a^{10}} - \frac{BblOc}{a^9} - \frac{3}{2} \frac{T(B)ck}{a^9 B} + \frac{L(B)he}{a^8 \sqrt{B}} \\
& + \frac{T(B)ge}{a^9 B} - \frac{ech}{a^{10}} - \frac{eck}{a^{10}} - \frac{kgb}{a^{10}} - \frac{kgb}{a^{10}} + \frac{eL(B)k}{a^8 \sqrt{B}} + \frac{eMg}{a^9} - \frac{BeFd}{a^8} \\
& - \frac{kQc}{a^9} - \frac{1}{2} \frac{eL^\#(B)k}{a^8 B^{3/2}} + \frac{\sqrt{B}blLLg}{a^9} - \frac{B^{3/2}blEd}{a^8} - \frac{\sqrt{B}blHe}{a^8} \\
& \left. + \frac{\sqrt{B}bl^2Hc}{a^{10}} + \frac{Ibl^2dg}{a^{11}} - \frac{Ibl^2hc}{a^{11}} - \frac{Ibldk}{a^9} + \frac{Iblhe}{a^9} + \frac{B^{3/2}blEbc}{a^{10}} \right)
\end{aligned} \tag{8}$$

$$\begin{aligned}
& -\frac{1}{2} \frac{L(B) h b l c}{a^{10} \sqrt{B}} - \frac{1}{2} \frac{e L^{\#}(B) b l g}{a^{10} B^{3/2}} + \frac{k L^{\#}(B) b l c}{a^{10} B^{3/2}} + \frac{\sqrt{B} k G b c}{a^{10}} + \frac{k K b l c}{a^{10} \sqrt{B}} \\
& - \frac{b l A c k}{a^{10} \sqrt{B}} - \frac{e L(B) g b l}{a^{10} \sqrt{B}} + \frac{B e F b c}{a^{10}} + \frac{e J b l c}{a^{10}} + \frac{3}{2} \frac{L(B) b c k}{a^{10} \sqrt{B}} - \frac{L(B) b g e}{a^{10} \sqrt{B}} \\
& + \frac{I b l b c k}{a^{11}} - \frac{I b l b g e}{a^{11}} \Big) \tau \wedge \sigma + \left(-\frac{1}{2} \frac{b l L(B) d f}{a^{10} \sqrt{B}} - \frac{\sqrt{B} b l^2 H}{a^7} - \frac{1}{2} \frac{b l R(B)}{a^6} \right. \\
& - \frac{e d f}{a^{10}} - \frac{\sqrt{B} b l L L f}{a^9} - \frac{B^{3/2} b l E b}{a^7} - \frac{k N f}{a^9 \sqrt{B}} - \frac{\sqrt{B} k G b}{a^7} - \frac{k K b l}{a^7 \sqrt{B}} + \frac{b l A k}{a^7 \sqrt{B}} \\
& + \frac{b l^2 L(A) f}{a^{10}} - \frac{T(B) e f}{a^9 B} - \frac{e M f}{a^9} - \frac{B e F b}{a^7} - \frac{e J b l}{a^7} - \frac{3}{2} \frac{L(B) b k}{a^7 \sqrt{B}} + \frac{k f b}{a^{10}} \\
& + \frac{k b l f}{a^{10}} + \frac{1}{2} \frac{b l L(B) h}{a^7 \sqrt{B}} + \frac{1}{2} \frac{b l S(B) f}{a^9 \sqrt{B}} - \frac{k L^{\#}(B) b l}{a^7 B^{3/2}} - \frac{I b l b k}{a^8} - \frac{I b l^2 d f}{a^{11}} \\
& + \frac{\sqrt{B} e P}{a^6} + \frac{B b l O}{a^6} + \frac{e h}{a^7} + \frac{e k}{a^7} - \frac{e^2 f}{a^{10}} + \frac{3}{2} \frac{T(B) k}{a^6 B} + \frac{k Q}{a^6} + \frac{I b l^2 h}{a^8} \\
& + \frac{L(B) b e f}{a^{10} \sqrt{B}} + \frac{e b l f L(B)}{a^{10} \sqrt{B}} + \frac{1}{2} \frac{e f L^{\#}(B) b l}{a^{10} B^{3/2}} + \frac{I b l b e f}{a^{11}} \Big) \tau \wedge \rho + \left(\frac{3}{2} \frac{L(B) k}{\sqrt{B} a^5} \right. \\
& - \frac{e L(B) f}{\sqrt{B} a^8} - \frac{1}{2} \frac{L(B) g b l}{\sqrt{B} a^7} + \frac{1}{2} \frac{c b l f L(B)}{\sqrt{B} a^{10}} + \frac{I b l k}{a^6} - \frac{I b l e f}{a^9} - \frac{I b l^2 g}{a^8} \\
& + \frac{I b l^2 c f}{a^{11}} + \frac{B^{3/2} b l E}{a^5} - \frac{g e}{a^7} + \frac{c e f}{a^{10}} + \frac{B e F}{a^5} - \frac{f k}{a^8} + \frac{\sqrt{B} k G}{a^5} \Big) \tau \wedge \zeta + \left(-\frac{g e}{a^7} \right. \\
& - \frac{1}{2} \frac{L^{\#}(B) e f}{B^{3/2} a^8} + \frac{L^{\#}(B) k}{B^{3/2} a^5} + \frac{1}{2} \frac{R(B)}{a^4} - \frac{1}{2} \frac{L(B) h}{\sqrt{B} a^5} - \frac{f k}{a^8} + \frac{J e}{a^5} - \frac{1}{2} \frac{S(B) f}{\sqrt{B} a^7} \\
& - \frac{1}{2} \frac{T(B) g}{B a^6} - \frac{A g b l}{\sqrt{B} a^7} - \frac{1}{2} \frac{L(B) b c f}{\sqrt{B} a^{10}} + \frac{1}{2} \frac{L(B) d f}{\sqrt{B} a^8} + \frac{1}{2} \frac{T(B) c f}{B a^9} \\
& + \frac{1}{2} \frac{L(B) b g}{\sqrt{B} a^7} - \frac{L(A) b l f}{a^8} - \frac{A e f}{\sqrt{B} a^8} + \frac{c e f}{a^{10}} + \frac{c b l f A}{\sqrt{B} a^{10}} + \frac{\sqrt{B} H b l}{a^5} - \frac{e L(B) f}{\sqrt{B} a^8} \\
& + \frac{I b l d f}{a^9} + \frac{I b l b g}{a^8} + \frac{k K}{a^5 \sqrt{B}} - \frac{I b l h}{a^6} - \frac{I b l b c f}{a^{11}} \Big) \tau \wedge \zeta^{\#} + \left(-\frac{L(B) b e}{a^6 \sqrt{B}} \right. \\
& + \frac{T(B) e}{a^5 B} + \frac{1}{2} \frac{b l L(B) d}{a^6 \sqrt{B}} - \frac{1}{2} \frac{b l S(B)}{a^5 \sqrt{B}} - \frac{I b l b e}{a^7} + \frac{I b l^2 d}{a^7} - \frac{b l^2 L(A)}{a^6} \\
& + \frac{\sqrt{B} b l L L}{a^5} - \frac{1}{2} \frac{e L^{\#}(B) b l}{a^6 B^{3/2}} + \frac{e d}{a^6} + \frac{e^2}{a^6} - \frac{e b l L(B)}{a^6 \sqrt{B}} + \frac{e M}{a^5} - \frac{k b}{a^6} - \frac{b l k}{a^6} \\
& \left. + \frac{k N}{a^5 \sqrt{B}} \right) \sigma \wedge \rho + \left(\frac{e L(B)}{a^4 \sqrt{B}} - \frac{1}{2} \frac{c b l L(B)}{\sqrt{B} a^6} + \frac{I b l e}{a^5} - \frac{I b l^2 c}{a^7} - \frac{c e}{a^6} \right.
\end{aligned}$$

$$\begin{aligned}
& + \frac{k}{a^4} \left) \sigma \wedge \zeta + \left(-\frac{1}{2} \frac{L(B) d}{a^4 \sqrt{B}} + \frac{1}{2} \frac{L(B) b c}{a^6 \sqrt{B}} - \frac{1}{2} \frac{T(B) c}{a^5 B} + \frac{1}{2} \frac{S(B)}{a^3 \sqrt{B}} - \frac{1 b l d}{a^5} \right. \\
& + \left. \frac{1 b l b c}{a^7} - \frac{c b l A}{\sqrt{B} a^6} + \frac{L(A) b l}{a^4} + \frac{1}{2} \frac{L^\#(B) e}{a^4 B^{3/2}} - \frac{c e}{a^6} + \frac{e L(B)}{a^4 \sqrt{B}} + \frac{A e}{\sqrt{B} a^4} + \frac{k}{a^4} \right) \\
& \sigma \wedge \zeta^\# + \left(\frac{1}{2} \frac{b l L(B)}{\sqrt{B} a^3} + \frac{1 b l^2}{a^4} + \frac{e}{a^3} \right) \rho \wedge \zeta + \left(-\frac{1}{2} \frac{L(B) b}{a^3 \sqrt{B}} + \frac{1}{2} \frac{T(B)}{a^2 B} \right. \\
& \left. - \frac{1 b l b}{a^4} + \frac{b l A}{\sqrt{B} a^3} + \frac{e}{a^3} \right) \rho \wedge \zeta^\# + \left(\frac{1}{2} \frac{L(B)}{a \sqrt{B}} + \frac{1 b l}{a^2} \right) \zeta \wedge \zeta^\#
\end{aligned}$$

frame2 > Eq1 := 4·U[4]-Torsion(SE[1], 11, 14);

$$Eq1 := 4 U_4 - \frac{L(B)}{a \sqrt{B}} + \frac{f}{a^4} - \frac{\sqrt{B} G}{a} \quad (9)$$

frame2 > Eq2 := 4·U[5]-Torsion(SE[1], 11, 15);

$$Eq2 := 4 U_5 - \frac{L^\#(B)}{a B^{3/2}} + \frac{f}{a^4} - \frac{K}{a \sqrt{B}} \quad (10)$$

frame2 > Eq3 := 3·U[4]-Torsion(SE[2], 12, 14);

$$Eq3 := 3 U_4 - \frac{1}{2} \frac{L(B)}{a \sqrt{B}} + \frac{c}{a^3} - \frac{f}{a^4} \quad (11)$$

frame2 > Eq4 := 3·U[5]-Torsion(SE[2], 12, 15);

$$Eq4 := 3 U_5 - \frac{1}{2} \frac{L^\#(B)}{a B^{3/2}} + \frac{c}{a^3} - \frac{L(B)}{a \sqrt{B}} - \frac{A}{a \sqrt{B}} - \frac{f}{a^4} \quad (12)$$

frame2 > Eq5 := 2·U[4]-Torsion(SE[3], 13, 14);

$$Eq5 := 2 U_4 - \frac{1 b l}{a^2} - \frac{c}{a^3} \quad (13)$$

frame2 > Eq6 := 2·U[5]-Torsion(SE[3], 13, 15);

$$Eq6 := 2 U_5 + \frac{1 b}{a^2} - \frac{A}{a \sqrt{B}} - \frac{c}{a^3} \quad (14)$$

frame2 > Eq7 := U[5]-Torsion(SE[4], 14, 15);

$$Eq7 := U_5 - \frac{1}{2} \frac{L^\#(B)}{a B^{3/2}} - \frac{1 b}{a^2} \quad (15)$$

frame2 > Eq8 := U[4] + Torsion(SE[5], 14, 15);

$$Eq8 := U_4 + \frac{1}{2} \frac{L(B)}{a \sqrt{B}} + \frac{1 b l}{a^2} \quad (16)$$

frame2 > solve({Eq1, Eq3, Eq5, Eq8}, {b1, f, c, U[4]});

$$\left\{ \begin{aligned}
b1 &= \frac{\frac{1}{10} I a (6 L(B) + G B)}{\sqrt{B}}, c = \frac{1}{10} \frac{a^2 (8 L(B) + 3 G B)}{\sqrt{B}}, f = \frac{3}{5} \frac{a^3 (L(B) + G B)}{\sqrt{B}}, U_4 \\
&= \frac{1}{10} \frac{L(B) + G B}{a \sqrt{B}} \end{aligned} \right\} \quad (17)$$

frame2 > solve({Eq2, Eq4, Eq6, Eq7}, {f, c, b, U[5]});

$$\left\{ \begin{aligned} b &= -\frac{\frac{1}{10} I a (-3 L^{\#}(B) + 2 B A + B K + B L(B))}{B^{3/2}}, c = \\ &-\frac{1}{10} \frac{a^2 (-L^{\#}(B) + 4 B A - 3 B K - 3 B L(B))}{B^{3/2}}, f = \\ &-\frac{1}{5} \frac{a^3 (-L^{\#}(B) + 4 B A - 3 B K + 2 B L(B))}{B^{3/2}}, U_5 \\ &= \frac{1}{10} \frac{2 L^{\#}(B) + 2 B A + B K + B L(B)}{a B^{3/2}} \end{aligned} \right\} \quad (18)$$

frame2 > C := expand($\left(\frac{1}{2} \cdot \left(\frac{1}{10} \frac{a^2 (8 L(B) + 3 G B)}{\sqrt{B}} - \frac{1}{10} \frac{a^2 (-L^{\#}(B) + 4 B A - 3 B K - 3 B L(B))}{B^{3/2}} \right) \right)$);

$$C := \frac{11}{20} \frac{a^2 L(B)}{\sqrt{B}} + \frac{3}{20} a^2 \sqrt{B} G + \frac{1}{20} \frac{a^2 L^{\#}(B)}{B^{3/2}} - \frac{1}{5} \frac{A a^2}{\sqrt{B}} + \frac{3}{20} \frac{a^2 K}{\sqrt{B}} \quad (19)$$

frame2 > F := expand($\left(\frac{1}{2} \cdot \left(\frac{3}{5} \frac{a^3 (L(B) + G B)}{\sqrt{B}} - \frac{1}{5} \frac{a^3 (-L^{\#}(B) + 4 B A - 3 B K + 2 B L(B))}{B^{3/2}} \right) \right)$);

$$F := \frac{1}{10} \frac{a^3 L(B)}{\sqrt{B}} + \frac{3}{10} a^3 \sqrt{B} G + \frac{1}{10} \frac{a^3 L^{\#}(B)}{B^{3/2}} - \frac{2}{5} \frac{a^3 A}{\sqrt{B}} + \frac{3}{10} \frac{a^3 K}{\sqrt{B}} \quad (20)$$

> B[#] := $\frac{\frac{1}{10} I a (6 L(B) + G B)}{\sqrt{B}}$: B0 := $-\frac{\frac{1}{10} I a (-3 L^{\#}(B) + 2 B A + B K + B L(B))}{B^{3/2}}$:

> U₄ := $\frac{1}{10} \frac{L(B) + G B}{a \sqrt{B}}$:

> U₅ := $\frac{1}{10} \frac{2 L^{\#}(B) + 2 B A + B K + B L(B)}{a B^{3/2}}$:

> eq1 := expand(subs({c=C, b=B0, b1=B[#], f=F}, Eq1));

$$eq1 := -\frac{1}{2} \frac{L(B)}{a \sqrt{B}} - \frac{3}{10} \frac{\sqrt{B} G}{a} + \frac{1}{10} \frac{L^{\#}(B)}{a B^{3/2}} - \frac{2}{5} \frac{A}{a \sqrt{B}} + \frac{3}{10} \frac{K}{a \sqrt{B}} \quad (21)$$

> Inv := expand($a^{-2} \cdot \left(\frac{1}{10} \frac{a^2 (8 L(B) + 3 G B)}{\sqrt{B}} + \frac{1}{10} \frac{a^2 (-L^{\#}(B) + 4 B A - 3 B K - 3 B L(B))}{B^{3/2}} \right)$);

$$Inv := \frac{1}{2} \frac{L(B)}{\sqrt{B}} + \frac{3}{10} \sqrt{B} G - \frac{1}{10} \frac{L^{\#}(B)}{B^{3/2}} + \frac{2}{5} \frac{A}{\sqrt{B}} - \frac{3}{10} \frac{K}{\sqrt{B}} \quad (22)$$

$$\text{frame2} > \text{expand}(eq1 \cdot a + \text{Inv});$$

$$0 \quad (23)$$

$$\text{frame2} > eq2 := \text{expand}(\text{subs}(\{c=C, b=B0, b1=B^\#, f=F\}, Eq2));$$

$$eq2 := -\frac{1}{10} \frac{L^\#(B)}{a B^{3/2}} + \frac{2}{5} \frac{A}{a \sqrt{B}} - \frac{3}{10} \frac{K}{a \sqrt{B}} + \frac{1}{2} \frac{L(B)}{a \sqrt{B}} + \frac{3}{10} \frac{\sqrt{B} G}{a} \quad (24)$$

$$\text{frame2} > \text{expand}(eq2 \cdot a - \text{Inv});$$

$$0 \quad (25)$$

$$\text{frame2} > eq3 := \text{expand}(\text{subs}(\{c=C, b=B0, b1=B^\#, f=F\}, Eq3));$$

$$eq3 := \frac{1}{4} \frac{L(B)}{a \sqrt{B}} + \frac{3}{20} \frac{\sqrt{B} G}{a} - \frac{1}{20} \frac{L^\#(B)}{a B^{3/2}} + \frac{1}{5} \frac{A}{a \sqrt{B}} - \frac{3}{20} \frac{K}{a \sqrt{B}} \quad (26)$$

$$\text{frame2} > \text{expand}\left(eq3 \cdot a - \frac{\text{Inv}}{2}\right);$$

$$0 \quad (27)$$

$$\text{frame2} > eq4 := \text{expand}(\text{subs}(\{c=C, b=B0, b1=B^\#, f=F\}, Eq4));$$

$$eq4 := \frac{1}{20} \frac{L^\#(B)}{a B^{3/2}} - \frac{1}{5} \frac{A}{a \sqrt{B}} + \frac{3}{20} \frac{K}{a \sqrt{B}} - \frac{1}{4} \frac{L(B)}{a \sqrt{B}} - \frac{3}{20} \frac{\sqrt{B} G}{a} \quad (28)$$

$$\text{frame2} > \text{expand}(eq4 + eq3);$$

$$0 \quad (29)$$

$$\text{frame2} > eq5 := \text{expand}(\text{subs}(\{c=C, b=B0, b1=B^\#, f=F\}, Eq5));$$

$$eq5 := \frac{1}{4} \frac{L(B)}{a \sqrt{B}} + \frac{3}{20} \frac{\sqrt{B} G}{a} - \frac{1}{20} \frac{L^\#(B)}{a B^{3/2}} + \frac{1}{5} \frac{A}{a \sqrt{B}} - \frac{3}{20} \frac{K}{a \sqrt{B}} \quad (30)$$

$$\text{frame2} > eq4 + eq5;$$

$$0 \quad (31)$$

$$\text{frame2} > eq6 := \text{expand}(\text{subs}(\{c=C, b=B0, b1=B^\#, f=F\}, Eq6));$$

$$eq6 := \frac{1}{20} \frac{L^\#(B)}{a B^{3/2}} - \frac{1}{5} \frac{A}{a \sqrt{B}} + \frac{3}{20} \frac{K}{a \sqrt{B}} - \frac{1}{4} \frac{L(B)}{a \sqrt{B}} - \frac{3}{20} \frac{\sqrt{B} G}{a} \quad (32)$$

$$\text{frame2} > eq5 + eq6;$$

$$0 \quad (33)$$

$$\text{frame2} > eq7 := \text{expand}(\text{subs}(\{c=C, b=B0, b1=B^\#, f=F\}, Eq7));$$

$$eq7 := 0 \quad (34)$$

$$\text{frame2} > eq8 := \text{expand}(\text{subs}(\{c=C, b=B0, b1=B^\#, f=F\}, Eq7));$$

$$eq8 := 0 \quad (35)$$

frame2 >