(%i1) `kill(all);`

(%o0) $done$

(%i1) `load(ctensor);`

(%o1) $/usr/share/maxima/5.24.0/share/tensor/ctensor.mac$

(%i2) `ct_coords:[r,theta,phi,t];`

(%o2) $[r, \theta, \phi, t]$

(%i3) `depends([%nu,%lambda],[r]);`

(%o3) $[\nu(r), \lambda(r)]$

(%i4) `lg:matrix([-exp(%lambda),0,0,0],[0,-r^2,0,0],[0,0,-r^2*(sin(theta))^2,0],[0,0,0,exp(%`

(%o4) $$\begin{pmatrix} -e^{\lambda} & 0 & 0 & 0 \\ 0 & -r^2 & 0 & 0 \\ 0 & 0 & -r^2 \sin(\theta)^2 & 0 \\ 0 & 0 & 0 & e^{\nu} \end{pmatrix}$$

(%i5) `cmetric(true);`

$Doyouwishtoseethemetricinverse?n;$

(%o5) $done$

(%i6)
```
/* last index is up in Gamma */
christof(mcs);
```

(%t6) $mcs_{1,1,1} = \frac{\frac{d}{d\,r}\,\lambda}{2}$

(%t7) $mcs_{1,2,2} = \frac{1}{r}$

(%t8) $mcs_{1,3,3} = \frac{1}{r}$

(%t9) $mcs_{1,4,4} = \frac{\frac{d}{d\,r}\,\nu}{2}$

(%t10) $mcs_{2,2,1} = -e^{-\lambda}\,r$

(%t11) $mcs_{2,3,3} = \frac{\cos(\theta)}{\sin(\theta)}$

(%t12) $mcs_{3,3,1} = -e^{-\lambda}\,r \sin(\theta)^2$

(%t13) $mcs_{3,3,2} = -\cos(\theta)\,\sin(\theta)$

(%t14) $mcs_{4,4,1}=\frac{e^{\nu-\lambda}\,\left(\frac{d}{d\,r}\,\nu\right)}{2}$

(%o14) *done*

```
(%i15) ricci(true);
```

(%t15) $ric_{1,1}=\frac{\frac{d}{d\,r}\,\lambda}{r}-\frac{\frac{d^2}{d\,r^2}\,\nu}{2}-\frac{\left(\frac{d}{d\,r}\,\nu\right)^2}{4}+\frac{\left(\frac{d}{d\,r}\,\lambda\right)\,\left(\frac{d}{d\,r}\,\nu\right)}{4}$

(%t16) $ric_{2,2}=-\frac{e^{-\lambda}\,\left(\frac{d}{d\,r}\,\nu\right)\,r}{2}+\frac{e^{-\lambda}\,\left(\frac{d}{d\,r}\,\lambda\right)\,r}{2}-e^{-\lambda}+1$

(%t17) $ric_{3,3}=-\frac{e^{-\lambda}\,\left(\frac{d}{d\,r}\,\nu\right)\,r\sin\left(\theta\right)^2}{2}+\frac{e^{-\lambda}\,\left(\frac{d}{d\,r}\,\lambda\right)\,r\sin\left(\theta\right)^2}{2}-e^{-\lambda}\sin\left(\theta\right)^2+$
$\sin\left(\theta\right)^2$

(%t18) $ric_{4,4}=\frac{e^{\nu-\lambda}\,\left(\frac{d}{d\,r}\,\nu\right)}{r}+\frac{e^{\nu-\lambda}\,\left(\frac{d^2}{d\,r^2}\,\nu\right)}{2}-\frac{e^{\nu-\lambda}\left(\frac{d}{d\,r}\,\nu\right)^2}{4}+\frac{e^{\nu-\lambda}\,\left(\frac{d}{d\,r}\,\nu\right)\,\left(\frac{d}{d\,r}\,\nu-\frac{d}{d\,r}\,\lambda\right)}{2}+$
$\frac{\left(\frac{d}{d\,r}\,\lambda\right)\,e^{\nu-\lambda}\,\left(\frac{d}{d\,r}\,\nu\right)}{4}$

(%o18) *done*

```
(%i19) leinstein(true);
```

(%t19) $lein_{1,1}=\frac{\left(\frac{d}{d\,r}\,\nu\right)\,r-e^{\lambda}+1}{r^2}$

(%t20) $lein_{2,2}=\frac{e^{-\lambda}\,r\,\left(\left(2\,\left(\frac{d^2}{d\,r^2}\,\nu\right)+\left(\frac{d}{d\,r}\,\nu\right)^2-\left(\frac{d}{d\,r}\,\lambda\right)\,\left(\frac{d}{d\,r}\,\nu\right)\right)\,r+2\,\left(\frac{d}{d\,r}\,\nu\right)-2\,\left(\frac{d}{d\,r}\,\lambda\right)\right)}{4}$

(%t21) $lein_{3,3}=\frac{e^{-\lambda}\,r\,\left(\left(2\,\left(\frac{d^2}{d\,r^2}\,\nu\right)+\left(\frac{d}{d\,r}\,\nu\right)^2-\left(\frac{d}{d\,r}\,\lambda\right)\,\left(\frac{d}{d\,r}\,\nu\right)\right)\,r+2\,\left(\frac{d}{d\,r}\,\nu\right)-2\,\left(\frac{d}{d\,r}\,\lambda\right)\right)\,\sin\left(\theta\right)^2}{4}$

(%t22) $lein_{4,4}=\frac{e^{\nu-\lambda}\,\left(\left(\frac{d}{d\,r}\,\lambda\right)\,r+e^{\lambda}-1\right)}{r^2}$

(%o22) *done*

```
(%i23) scurvature();
```

(%o23) $\frac{e^{-\lambda}\,\left(\left(2\,\left(\frac{d^2}{d\,r^2}\,\nu\right)+\left(\frac{d}{d\,r}\,\nu\right)^2-\left(\frac{d}{d\,r}\,\lambda\right)\,\left(\frac{d}{d\,r}\,\nu\right)\right)\,r^2+\left(4\,\left(\frac{d}{d\,r}\,\nu\right)-4\,\left(\frac{d}{d\,r}\,\lambda\right)\right)\,r-4\,e^{\lambda}+4\right)}{2\,r^2}$

```
(%i24) mu;
```

(%o24) μ

```
(%i25) %alpha;
```

(%o25) α

```
(%i26) %lambda;
```

(%o26) λ

```
(%i27) %mu;
```

(%o27) μ