In[1]:=
```
Clear["Global`*"]
```

In[2]:=
```
SetDirectory["/Users/kevin/papers/math/GRcode"]
```

Out[2]=
```
/Users/kevin/papers/math/GRcode
```

In[3]:=
```
<< GREAT.m
```

```
GREAT functions are: IMetric, Christoffel,
  Riemann, Ricci, SCurvature, EinsteinTensor, SqRicci, SqRiemann.

Enter 'helpGREAT' for this list of functions
```

In[4]:=
```
x = {t, r, theta, phi}
```

Out[4]=
```
{t, r, theta, phi}
```

In[7]:=
```
(g = {{-c^2, 0, 0, 0}, {0, a[t]^2 / (1 - k * r^2 / L^2), 0, 0},
      {0, 0, a[t]^2 * r^2, 0}, {0, 0, 0, a[t]^2 * r^2 * Sin[theta]^2}}) // MatrixForm
```

Out[7]//MatrixForm=

$$\begin{pmatrix} -c^2 & 0 & 0 & 0 \\ 0 & \frac{a[t]^2}{1-\frac{k\,r^2}{L^2}} & 0 & 0 \\ 0 & 0 & r^2\,a[t]^2 & 0 \\ 0 & 0 & 0 & r^2\,a[t]^2\,\text{Sin}[\text{theta}]^2 \end{pmatrix}$$

In[8]:=
```
Ricci[g, x]
```

Out[8]=

$$\left\{\left\{-\frac{3\,a''[t]}{a[t]}, 0, 0, 0\right\}, \left\{0, \frac{2\,c^2\,k + 2\,L^2\,a'[t]^2 + L^2\,a[t]\,a''[t]}{c^2\,\left(L^2 - k\,r^2\right)}, 0, 0\right\},\right.$$
$$\left\{0, 0, r^2\left(\frac{2\,k}{L^2} + \frac{2\,a'[t]^2}{c^2} + \frac{a[t]\,a''[t]}{c^2}\right), 0\right\},$$
$$\left.\left\{0, 0, 0, \frac{r^2\,\text{Sin}[\text{theta}]^2\,\left(2\,c^2\,k + 2\,L^2\,a'[t]^2 + L^2\,a[t]\,a''[t]\right)}{c^2\,L^2}\right\}\right\}$$

In[9]:=
```
SCurvature[g, x]
```

Out[9]=

$$\frac{6\,\left(c^2\,k + L^2\,a'[t]^2 + L^2\,a[t]\,a''[t]\right)}{c^2\,L^2\,a[t]^2}$$