

```
In[1]:= Needs ["GRQUICK`"]
```

The convention for this program follow Sean

M. Carroll's (Spacetime and Geometry) and the indices run from 0 to D-1.

While working do not use the variables GARRAY, RARRAY, RsARRAY, CHARRAY, SPEEDOFLIGHT.

Type ?helpGRQUICK for a list of functions or ?Function for a function description.

More functions and improvements coming soon!!'

Global Metric Equation 2.36

```
In[2]:= Metin[DiagonalMatrix[{-1, 1^2 Cosh[t/1]^2,
    1^2 Cosh[t/1]^2 Sin[x]^2, 1^2 Cosh[t/1]^2 Sin[x]^2 Sin[y]^2}], {t, x, y, z}]
```

Metric Success

```
In[3]:= MatrixForm[GMET]
```

Out[3]//MatrixForm=

$$\begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & 1^2 \cosh\left[\frac{t}{1}\right]^2 & 0 & 0 \\ 0 & 0 & 1^2 \cosh\left[\frac{t}{1}\right]^2 \sin[x]^2 & 0 \\ 0 & 0 & 0 & 1^2 \cosh\left[\frac{t}{1}\right]^2 \sin[x]^2 \sin[y]^2 \end{pmatrix}$$

```
In[4]:= Einstein[0, 0] + 3/1^2 * Metric[0, 0]
```

Out[4]= 0

```
In[5]:= Einstein[1, 1] + 3/1^2 * Metric[1, 1]
```

Out[5]= 0

```
In[6]:= Einstein[2, 2] + 3/1^2 * Metric[2, 2]
```

Out[6]= 0

```
In[7]:= Einstein[3, 3] + 3/1^2 * Metric[3, 3]
```

Out[7]= 0

Conformal Metric Equation 2.39

```
In[8]:= Metin[
    DiagonalMatrix[1^2/(Cos[t]^2) {-1, 1, Sin[x]^2, Sin[x]^2 Sin[y]^2}], {t, x, y, z}]
```

Metric Success

In[9]:= **MatrixForm**[GMET]

Out[9]//MatrixForm=

$$\begin{pmatrix} -l^2 \sec[t]^2 & 0 & 0 & 0 \\ 0 & l^2 \sec[t]^2 & 0 & 0 \\ 0 & 0 & l^2 \sec[t]^2 \sin[x]^2 & 0 \\ 0 & 0 & 0 & l^2 \sec[t]^2 \sin[x]^2 \sin[y]^2 \end{pmatrix}$$

In[10]:= **Einstein**[0, 0] + 3/l^2 * **Metric**[0, 0]

Out[10]= 0

In[11]:= **Einstein**[1, 1] + 3/l^2 * **Metric**[1, 1]

Out[11]= 0

In[12]:= **Einstein**[2, 2] + 3/l^2 * **Metric**[2, 2]

Out[12]= 0

In[13]:= **Einstein**[3, 3] + 3/l^2 * **Metric**[3, 3]

Out[13]= 0

Static Metric Equation 2.40

In[14]:= **Metin**[

DiagonalMatrix[{- (1 - r^2/l^2), (1 - r^2/l^2)^-1, r^2, r^2 Sin[x]^2}], {t, r, x, y}]

Metric Success

In[15]:= **MatrixForm**[GMET]

Out[15]//MatrixForm=

$$\begin{pmatrix} -1 + \frac{r^2}{l^2} & 0 & 0 & 0 \\ 0 & \frac{1}{1 - \frac{r^2}{l^2}} & 0 & 0 \\ 0 & 0 & r^2 & 0 \\ 0 & 0 & 0 & r^2 \sin[x]^2 \end{pmatrix}$$

In[16]:= **Einstein**[0, 0] + 3/l^2 * **Metric**[0, 0]

$$\text{Out[16]} = \frac{3 (l^2 - r^2)}{l^4} + \frac{3 \left(-1 + \frac{r^2}{l^2} \right)}{l^2}$$

In[17]:= **Simplify**[$\frac{3 (l^2 - r^2)}{l^4} + \frac{3 \left(-1 + \frac{r^2}{l^2} \right)}{l^2}$]

Out[17]= 0

In[18]:= **Einstein**[1, 1] + 3/l^2 * **Metric**[1, 1]

$$\text{Out[18]} = -\frac{3}{l^2 - r^2} + \frac{3}{l^2 \left(1 - \frac{r^2}{l^2} \right)}$$

In[19]:= **Simplify** $\left[-\frac{3}{1^2 - r^2} + \frac{3}{1^2 \left(1 - \frac{r^2}{1^2}\right)}\right]$

Out[19]= 0

In[20]:= **Einstein**[2, 2] + 3/1^2 * **Metric**[2, 2]

Out[20]= 0

In[21]:= **Einstein**[3, 3] + 3/1^2 * **Metric**[3, 3]

Out[21]= 0

Planar Metric Equation 2.44

In[22]:= **Metin**[**DiagonalMatrix**[1^2/t^2 {-1, 1, 1, 1}], {t, x, y, z}]

Metric Success

In[23]:= **MatrixForm**[**GMET**]

Out[23]//MatrixForm=

$$\begin{pmatrix} -\frac{1^2}{t^2} & 0 & 0 & 0 \\ 0 & \frac{1^2}{t^2} & 0 & 0 \\ 0 & 0 & \frac{1^2}{t^2} & 0 \\ 0 & 0 & 0 & \frac{1^2}{t^2} \end{pmatrix}$$

In[24]:= **Einstein**[0, 0] + 3/1^2 * **Metric**[0, 0]

Out[24]= 0

In[25]:= **Einstein**[1, 1] + 3/1^2 * **Metric**[1, 1]

Out[25]= 0

In[26]:= **Einstein**[2, 2] + 3/1^2 * **Metric**[2, 2]

Out[26]= 0

In[27]:= **Einstein**[3, 3] + 3/1^2 * **Metric**[3, 3]

Out[27]= 0