

General Relativity HW 7 Quiz

Name _____

You know the drill!

1. A 2D surface is embedded into Minkowski space with metric $ds^2 = -dt^2 + dx^2 + dy^2 + dz^2$ by the following embedding function: $\{t, x, y, z\} = \{\sinh(u), \sin(v), \cosh(u), \cos(v)\}$. Calculate the Riemann tensor for this 2D space in the $\{u, v\}$ coordinate system. You should be able to do all parts of this by hand!

2. Given:

$$g_{\mu\nu} = \begin{pmatrix} -1+r^2 & 0 & 0 & 0 \\ 0 & \frac{1}{1-r^2} & 0 & 0 \\ 0 & 0 & r^2 & 0 \\ 0 & 0 & 0 & r^2 \sin^2(\theta) \end{pmatrix}, R_{\mu\nu} = \begin{pmatrix} 3(-1+r^2) & 0 & 0 & 0 \\ 0 & \frac{3}{1-r^2} & 0 & 0 \\ 0 & 0 & 3r^2 & 0 \\ 0 & 0 & 0 & 3r^2 \sin^2(\theta) \end{pmatrix}$$

find the form of $T_{\mu\nu}$ that would be the source for this geometry.