

Minkowsky Metric in spherical coordinates:

x^μ

$x^0 = t.$

$x^1 = r.$

$x^2 = \theta.$

$x^3 = \phi.$

$g_{\mu\nu}$

$g_{00} = 1.$

$g_{01} = 0.$

$g_{02} = 0.$

$g_{03} = 0.$

$g_{10} = 0.$

$g_{11} = -1.$

$g_{12} = 0.$

$g_{13} = 0.$

$g_{20} = 0.$

$g_{21} = 0.$

$g_{22} = -r^2.$

$g_{23} = 0.$

$g_{30} = 0.$

$g_{31} = 0.$

$g_{32} = 0.$

$g_{33} = -r^2 \sin(\theta)^2.$

$\sqrt{\hspace{0.5cm}} = \sqrt{-\det(g_{\mu\nu})}$

$\sqrt{\hspace{0.5cm}} = \sqrt{r^4 \sin(\theta)^2}.$

$g^{\mu\nu}$

$g^{00} = 1.$

$g^{01} = 0.$

$g^{02} = 0.$

$g^{03} = 0.$

$g^{10} = 0.$

$g^{11} = -1.$

$g^{12} = 0.$

$g^{13} = 0.$

$g^{20} = 0.$

$g^{21} = 0.$

$g^{22} = -\frac{1}{r^2}.$

$g^{23} = 0.$

$g^{30} = 0.$

$g^{31} = 0.$

$g^{32} = 0.$

$g^{33} = -\frac{1}{r^2 \sin(\theta)^2}.$

$\Gamma^\sigma_{\hspace{0.5cm}\mu\nu}$

$\Gamma^0_{00} = 0.$

$\Gamma^0_{01} = 0.$

$\Gamma^0_{02} = 0.$

$\Gamma^0_{03} = 0.$

$\Gamma^0_{10} = 0.$

$\Gamma^0_{11} = 0.$

$\Gamma^0_{12} = 0.$

$\Gamma^0_{13} = 0.$

$\Gamma^0_{20} = 0.$

$\Gamma^0_{21} = 0.$

$\Gamma^0_{22} = 0.$

$\Gamma^0_{23} = 0.$

$\Gamma^0_{30} = 0.$

$\Gamma^0_{31} = 0.$

$\Gamma^0_{32} = 0.$

$\Gamma^0_{33} = 0.$

$\Gamma^1_{00} = 0.$

$\Gamma^1_{01} = 0.$

$\Gamma^1_{02} = 0.$

$\Gamma^1_{03} = 0.$

$\Gamma^1_{10} = 0.$

$\Gamma^1_{11} = 0.$

$\Gamma^1_{12} = 0.$

$\Gamma^1_{13} = 0.$

$\Gamma^1_{20} = 0.$

$\Gamma^1_{21} = 0.$

$\Gamma^1_{22} = -r.$

$\Gamma^1_{23} = 0.$

$\Gamma^1_{30} = 0.$

$\Gamma^1_{31} = 0.$

$\Gamma^1_{32} = 0.$

$\Gamma^1_{33} = -r \sin(\theta)^2.$

$$\begin{aligned}\Gamma_{00}^2 &= 0, \\ \Gamma_{01}^2 &= 0, \\ \Gamma_{02}^2 &= 0, \\ \Gamma_{03}^2 &= 0, \\ \Gamma_{10}^2 &= 0, \\ \Gamma_{11}^2 &= 0, \\ \Gamma_{12}^2 &= \frac{1}{r}, \\ \Gamma_{13}^2 &= 0, \\ \Gamma_{20}^2 &= 0, \\ \Gamma_{21}^2 &= \frac{1}{r}, \\ \Gamma_{22}^2 &= 0, \\ \Gamma_{23}^2 &= 0, \\ \Gamma_{30}^2 &= 0, \\ \Gamma_{31}^2 &= 0, \\ \Gamma_{32}^2 &= 0, \\ \Gamma_{33}^2 &= -\cos(\theta)\sin(\theta).\end{aligned}$$

$$\begin{aligned}\Gamma_{00}^3 &= 0, \\ \Gamma_{01}^3 &= 0, \\ \Gamma_{02}^3 &= 0, \\ \Gamma_{03}^3 &= 0, \\ \Gamma_{10}^3 &= 0, \\ \Gamma_{11}^3 &= 0, \\ \Gamma_{12}^3 &= 0, \\ \Gamma_{13}^3 &= \frac{1}{r}, \\ \Gamma_{20}^3 &= 0, \\ \Gamma_{21}^3 &= 0, \\ \Gamma_{22}^3 &= 0, \\ \Gamma_{23}^3 &= \frac{\cos(\theta)}{\sin(\theta)}, \\ \Gamma_{30}^3 &= 0, \\ \Gamma_{31}^3 &= \frac{1}{r}, \\ \Gamma_{32}^3 &= \frac{\cos(\theta)}{\sin(\theta)}, \\ \Gamma_{33}^3 &= 0.\end{aligned}$$

$$\boxed{R_{\mu\nu}}$$

$$\begin{aligned}R_{00} &= 0, \\ R_{01} &= 0, \\ R_{02} &= 0, \\ R_{03} &= 0, \\ R_{10} &= 0, \\ R_{11} &= 0, \\ R_{12} &= 0, \\ R_{13} &= 0, \\ R_{20} &= 0, \\ R_{21} &= 0, \\ R_{22} &= 0, \\ R_{23} &= 0, \\ R_{30} &= 0, \\ R_{31} &= 0, \\ R_{32} &= 0, \\ R_{33} &= 0.\end{aligned}$$

$$\boxed{R^\mu{}_\nu}$$

$$\begin{aligned}R^0{}_0 &= 0, \\ R^0{}_1 &= 0, \\ R^0{}_2 &= 0, \\ R^0{}_3 &= 0, \\ R^1{}_0 &= 0, \\ R^1{}_1 &= 0, \\ R^1{}_2 &= 0, \\ R^1{}_3 &= 0, \\ R^2{}_0 &= 0, \\ R^2{}_1 &= 0, \\ R^2{}_2 &= 0, \\ R^2{}_3 &= 0, \\ R^3{}_0 &= 0, \\ R^3{}_1 &= 0, \\ R^3{}_2 &= 0, \\ R^3{}_3 &= 0.\end{aligned}$$

$$\boxed{R}$$

$$R=0.$$

$$\boxed{G^\mu{}_\nu}$$

$$\begin{aligned}G^0{}_0 &= 0, \\ G^0{}_1 &= 0, \\ G^0{}_2 &= 0, \\ G^0{}_3 &= 0, \\ G^1{}_0 &= 0, \\ G^1{}_1 &= 0, \\ G^1{}_2 &= 0, \\ G^1{}_3 &= 0, \\ G^2{}_0 &= 0, \\ G^2{}_1 &= 0, \\ G^2{}_2 &= 0, \\ G^2{}_3 &= 0, \\ G^3{}_0 &= 0, \\ G^3{}_1 &= 0, \\ G^3{}_2 &= 0, \\ G^3{}_3 &= 0.\end{aligned}$$

$$\boxed{G}$$

$$G=0.$$

$$G^\mu_{\nu\gamma\mu}=0$$

$$G^\mu_{0\mu}=0.$$

$$G^\mu_{1\mu}=0.$$

$$G^\mu_{2\mu}=0.$$

$$G^\mu_{3\mu}=0.$$

$$g^{\mu\nu}\,\Gamma^\lambda_{\mu\nu}=0?$$

$$g^{\mu\nu}\,\Gamma^0_{\mu\nu}=0.$$

$$g^{\mu\nu}\,\Gamma^1_{\mu\nu}=r^3\sin(\theta)^4+r^3.$$

$$g^{\mu\nu}\,\Gamma^2_{\mu\nu}=\cos(\theta)r^2\sin(\theta)^3.$$

$$g^{\mu\nu}\,\Gamma^3_{\mu\nu}=0.$$