

$$\cosh^2 \beta - \sinh^2 \beta = 1 \quad \frac{v}{c} = \tanh \beta$$

$$dx^2 - dt^2 = d\rho^2 - \rho^2 d\alpha^2 = -du dv$$

$$-\left(1 - \frac{2m}{r}\right) dt^2 + \frac{dr^2}{1 - \frac{2m}{r}} = -dT^2 + \left(dr + \sqrt{\frac{2m}{r}} dT\right)^2 = -\frac{32m^3}{r} e^{-r/2m} dU dV$$

$$\sigma^T = dT = dt + \frac{\sqrt{\frac{2m}{r}}}{1 - \frac{2m}{r}} dr \quad \sigma^R = \sqrt{\frac{2m}{r}} dR = \frac{dr}{1 - \frac{2m}{r}} + \sqrt{\frac{2m}{r}} dt$$

$$\dot{\phi} = \frac{\ell}{r^2} \quad \dot{t} = e / \left(1 - \frac{2m}{r}\right)$$

$$\dot{r}^2 = \begin{cases} e^2 - \left(1 + \frac{\ell^2}{r^2}\right) \left(1 - \frac{2m}{r}\right) & \text{(timelike)} \\ e^2 - \left(1 - \frac{2m}{r}\right) \frac{\ell^2}{r^2} & \text{(null)} \end{cases}$$