

Kruskal-Szekeres coordinates for Schwarzschild spacetime

$$\left\{ \begin{array}{l} U = \sqrt{\frac{r}{2GM} - 1} e^{\frac{r}{4GM}} \cosh\left(\frac{t}{4GM}\right) \\ V = \sqrt{\frac{r}{2GM} - 1} e^{\frac{r}{4GM}} \sinh\left(\frac{t}{4GM}\right) \end{array} \right\} \quad \text{for } r > 2GM$$

$$\left\{ \begin{array}{l} U = \sqrt{1 - \frac{r}{2GM}} e^{\frac{r}{4GM}} \sinh\left(\frac{t}{4GM}\right) \\ V = \sqrt{1 - \frac{r}{2GM}} e^{\frac{r}{4GM}} \cosh\left(\frac{t}{4GM}\right) \end{array} \right\} \quad \text{for } r < 2GM$$

$$\Rightarrow \left\{ \begin{array}{l} U^2 - V^2 = \left(\frac{r}{2GM} - 1\right) e^{\frac{r}{2GM}} \\ V = \tanh\left(\frac{t}{4GM}\right) U \quad \text{for } r > 2GM \\ V = \coth\left(\frac{t}{4GM}\right) U \quad \text{for } r < 2GM \end{array} \right.$$





