Metric Components

1. Time Component ( g\_{tt} ):

g\_{tt}(x) = -\left(1 - \frac{2GM}{r\_s \tanh(x) c^2}\right)

• Physical Interpretation: This component of the metric tensor describes how time intervals are affected by the gravitational field.

• As x \to \pm \infty (which corresponds to r approaching the event horizon r\_s ), g\_{tt} approaches zero. This implies extreme time dilation.

• For an observer far from the black hole (large r ), time flows normally. For an observer close to the event horizon, time appears to slow down significantly.

2. Radial Component ( g\_{xx} ):

g\_{xx}(x) = \left(1 - \frac{2GM}{r\_s \tanh(x) c^2}\right)^{-1} r\_s^2 \text{sech}^2(x)

• Physical Interpretation: This component describes how spatial distances are stretched by the gravitational field.

• Near the event horizon ( r \approx r\_s ), g\_{xx} becomes very large, indicating that the radial distance is stretched significantly.

• This means that as an object approaches the event horizon, the space around it is stretched in such a way that distances appear much larger than they would in a flat spacetime.

Potential Term

1. Potential Term ( V(x) ):

V(x) = -\frac{GM}{r\_s \tanh(x)}

• Physical Interpretation: This potential term describes the gravitational potential energy of a particle in the field of the black hole.

• As x \to \pm \infty (which corresponds to r approaching the event horizon r\_s ), the potential becomes very large (negative), indicating a very strong gravitational pull.

• The potential well created by the black hole affects particles in such a way that they are strongly attracted towards the black hole, and their potential energy decreases as they approach the event horizon.