

Q1) Draw Penrose diagram for  $(t, r)$  part of Minkowski in spherical

$$ds^2 = \underbrace{dt^2 - dr^2}_{\text{useful dimensions}} - r^2 d\Omega^2$$

useful dimensions

$$ds^2 = dt^2 - dr^2$$

We do the same as for Minkowski (Cartesian):

$$t \pm r = \tan\left(\frac{\Psi \pm \xi}{2}\right)$$

$$\Rightarrow ds^2 = \frac{1}{2 \cos\left(\frac{\Psi+\xi}{2}\right) \cos\left(\frac{\Psi-\xi}{2}\right)} [d\Psi^2 - d\xi^2]$$

$$t \in (-\infty, \infty); r \in [0, \infty); \quad \Psi, \xi \in [-\pi, \pi]$$

The diagram should look similar to the  
BU Penrose diagram as  $r \geq 0$ :

