General Relativity HW 9 Quiz Name_____

You know the drill!

1. Two observers in two rockets are hovering above a Schwarzschild black hole of mass *M*. They hover at a fixed radius *r* such that

$$(\frac{r}{2GM} - 1)^{1/2} e^{r/4GM} = 2$$

with fixed angular position. The first observer leaves this position at $t = 0$ and travels into the black hole **on a straight line path in a Kruskal diagram** until destroyed in the singularity at the point where the singularity crosses the line $R = \sqrt{3}$ where R is the Kruskal radial coordinate (Note *r,t* are Schwarzschild coordinate values). The other observer continues to hover at radius *r*.

   a) On a Kruskal diagram, sketch the worldlines of the two observers.
   b) Is the observer who goes into the black hole following a timelike worldline?

2. Argue that once inside of a Schwarzschild black hole, that any angular motion will only make your journey to the singularity even shorter than without it.