general relativity – November 24, 2009

material discussed in class

Roughly 5.6 and 5.7 of the book.

exercises

- Consider again the Schwarzschild solution. Someone is at $t = 0$ at $r = 2MG$. Show that no matter what this person does, he or she will always hit the singularity in a proper time $\Delta\tau \leq \pi MG$.
- Take the Schwarzschild metric and replace M with a function $M(r)$ to get

  $$ds^2 = -(1-\frac{2GM(r)}{r})dt^2+(1-\frac{2GM(r)}{r})^{-1}dr^2+r^2(d\theta^2+\sin^2\theta d\phi^2). \quad (1)$$

  Suppose that this is a solution of the Einstein equation for some perfect-fluid energy momentum tensor in comoving coordinates. Compute G_{00} from (1) and from this $\rho(r)$.