PHYS 514   GENERAL RELATIVITY AND COSMOLOGY   2018
READING and PROBLEM SET 7

READING: Textbook, Sections 5.6 - 5.8, 6.1 - 6.5.

PROBLEMS, due March 22, 2018 (in class):

1. A particle falls radially into a Schwarzschild metric. As measured by proper time at infinity, what is its inward coordinate velocity at a radius r? What is the locally measured velocity relative to a stationary observer at the same radius?

2/3. In class I derived the Schwarzschild metric, but I only gave the result for the metric of a charged black hole. Derive this metric, following what was done in class for the uncharged black hole. The first step is to derive the energy-momentum tensor in the tetrad basis of a point charge at the origin. Based on the result, derive the metric, making use of the same initial ansatz for the metric used for Schwarzschild.

4. Consider a charged black hole with charge greater than the critical charge (the charge which yields an extremal charged black hole). This black hole has a naked singularity. Show, however, that geodesics of massive particles feel a repulsive force from the singularity.

5. Textbook, Problem 7.1.

6. Textbook, Problem 7.6.