general relativity – November 5, 2009

material discussed in class

Parts of 7.1, 7.4, 7.5, 7.6 in the book.

exercises

• Consider a system of particles moving in a plane with common angular frequency $\omega$. Assume the $i$th particle is located at time zero at position $(r_i \cos \phi_i, r_i \sin \phi_i)$ in the plane. Show that the average total emitted power is given by

$$\left\langle \frac{\partial E}{\partial t} \right\rangle = -\frac{32G\omega^6}{5} \sum_{i,j} m_i m_j r_i^2 r_j^2 \cos 2(\phi_i - \phi_j).$$

• Consider a bar with length one meter, with a mass of one kilogram at each endpoint. Assume this bar rotates once a second. Compute the power emitted due to gravitational radiation. Remember $c = 1$ in our units.