general relativity – September 6, 2004

material discussed in class

Roughly equal to sections 1.1-1.3 in Carroll. (or page 1–7 in the lecture notes)

exercises

- Show that the metric on the unit two-sphere, in standard spherical coordinates, is given by
$$ds^2 = d\theta^2 + \sin^2\theta d\phi^2.$$
- Discuss the car and garage paradox: Consider a car and garage of equal proper length. The driver speeds towards the garage, and a doorman at the garage is instructed to slam the door shut as soon as the back end of the car enters the garage. According to the doorman, "the car Lorentz contracted and easily fitted into the garage then I slammed the door." According to the driver, "the garage Lorentz contracted and was too small for the car when I entered the garage." Who is correct and why? Assume the car crashes through the back wall of the garage without stopping or slowing down.
- Exercises 1.1-1.5 in Carroll.