General Relativity

Institute of Physics Bhubaneshwar

Homework 4

Textbook: Sean Carroll's *Spacetime and Geometry*

Remember each homework carries weight.

Late submissions will not be accepted.

1. Starting with the action
$$I = \frac{1}{2} \int_\gamma g_{\mu\nu}(x) \frac{dx^\mu}{d\tau} \frac{dx^\nu}{d\tau} d\tau \tag{0.1}$$

   along the path γ, and considering infinitesimal variations of the path (keeping end points fixed)
$$x^\mu \to x^\mu + \delta x^\mu, \tag{0.2}$$

   show that the class of curves extremising the action I are geodesics.

2. Chapter 3, exercise 8.

3. Chapter 3, exercise 12.

4. Read section 3.10 and arrive at the geodesic deviation equation (3.208). Show your calculations.