Christoffel Symbols and Curvature Tensors for Two Classic Geometries

March 28: Calculate the Christoffel symbols for the cosmological metric

$$ds^2 = -dt^2 + R(t)^2 \left[\frac{dr^2}{1 - kr^2} + r^2\, d\theta^2 + r^2 \sin^2\theta\, d\phi^2 \right]$$

where $R(t)$ is an arbitrary (twice differentiable) positive function and k is an arbitrary constant. (Cf. pp. 324–325 of Schutz.)

April 4: Calculate the Christoffel symbols for the static spherically symmetric metric

$$dx^2 = -e^{2\Phi(r)} dt^2 + e^{2\Lambda(r)} dr^2 + r^2\, d\theta^2 + r^2 \sin\theta^2\, d\phi^2$$

where $\Phi(r)$ and $\Lambda(r)$ are arbitrary functions. (Cf. Exercise 6.35 of Schutz; Exercise 11.20 is a special case.)

April 11: Calculate the Riemann tensor for the cosmological metric.

April 18: Calculate the Riemann tensor for the static spherically symmetric metric.

Other announcements

March 6: Colloquium by Andrew Strominger, "String Theory, Black Holes and the Fundamental Laws of Nature", 4:00 p.m. in ENPH 202. (Attendance not mandatory, of course.)

April 9: Test through Chapter 8 and possibly part of Chapter 12 (to be decided later).

April 14: No class; read the article on "Topology and the Cosmic Microwave Background" by Janna Levin, *Physics Reports* **365** (2002) 251–333.