

Astr/Phys 571 – Gravitation, Spring 2005

Homework #6

Due date: May 4

1. In the linearized theory of gravity, show that the continuity equation for matter $\nabla_\nu T^{\mu\nu} = 0$ is inconsistent with the field equations for the metric perturbation. Show that this inconsistency is of second order in the metric perturbation and, hence, is negligible.
2. Consider Einstein's solution of a static universe with matter and vacuum only. Show that this solution is unstable. (*Hint:* consider small perturbations of the matter density away from the static solution and show that they grow exponentially with time.)