PH523 Assignment No. 2

Due date: September 29, 2003

1. In a weak gravitational field represented by a first order metric with

$$g_{00} = -(1 + 2\,\phi/c^2)$$

show that the Lorentz time-dilation factor should be replaced by

$$(1 - v^2/c^2 + 2\,\phi/c^2)^{-1/2}.$$

.

2. Using an analysis of the type in Section 4.6 of Weinberg (Eqs(4.6.1 - 4.6.4)), show by direct calculation that the covariant divergence of a contravariant rank 2 tensor is

$$T^{\mu\nu}{}_{;\,\mu} = \frac{\partial T^{\mu\nu}}{\partial x^\mu} + \Gamma^\mu_{\mu\lambda}\,T^{\lambda\nu} + \Gamma^\nu_{\mu\lambda}\,T^{\mu\lambda}.$$