ADVANCED DYNAMICS — PHY-4241/5227 HOMEWORK 12

(Wednesday, April 7, 2004) Due on Monday (afternoon), April 12, 2004

PROBLEM 29

(Griffiths Problem 12.50)

In the same way that the contraction, or relativistic dot product, of two four vectors is a Lorentz invariant, the contraction of two relativistic tensors is also a Lorentz invariant.

a) Compute the three Lorentz invariants from the contraction of the following tensors:

 $F^{\mu\nu}F_{\mu\nu}$, $G^{\mu\nu}G_{\mu\nu}$, and $F^{\mu\nu}G_{\mu\nu}$,

in terms of the electric and magnetic $(\mathbf{E} \text{ and } \mathbf{B})$ fields.

b) Suppose that in one inertial frame $\mathbf{B} = 0$ but $\mathbf{E} \neq 0$ (at some point P). Is it possible to find another system in which the *electric field* is zero at P?