ADVANCED DYNAMICS — PHY-4241/5227 HOMEWORK 11

(Wednesday, March 24, 2004) Monday, April 5, 2004 (late afternoon)

PROBLEM 26

Griffiths 12.58

PROBLEM 27

The electromagnetic field tensor transforms according to

$$F'^{\alpha\beta} = a^{\alpha}_{\ \gamma} a^{\beta}_{\ \delta} F^{\gamma\delta} \,.$$

Choose the particular case of a Lorentz boost in x^1 -direction, $\vec{v} = v \hat{e}_1$, and write down the transformation law for the electric field \vec{E} and the magnetic induction \vec{B} .

PROBLEM 28

The non-zero fields \vec{E} and \vec{B} are non-parallel in inertial frame K. Inertial frame K' moves with velocity \vec{v} with respect to K. Find a physical velocity \vec{v} so that $\vec{E'}$ and $\vec{B'}$ are parallel. (Hint: Try $\vec{E} = E_2 \hat{e}_2$, $\vec{B} = B_2 \hat{e}_2 + B_3 \hat{e}_3$ and $\vec{v} = v \hat{e}_1$.)