Physics 323. Problem set V. Tuesday, May 17, 2005

DUE TUESDAY, May 24, 2005

1. Jackson, 16.10 (c).

2. Jackson, 16.11

3. In class, we have shown that for a relativistic particle the dominant force induced by the emission of radiation is proportional to the velocity of the particle and of opposite sign. The magnitude of this force is proportional to the square of the energy of the particle and also to the square of the components of the electric and magnetic field in the direction orthogonal to the direction of motion.

a. What would be the result of the force, for a relativistic particle, in the case in which the electric field is parallel to the velocity ?

b. What is the energy loss per unit time as the result of the radiation process in this case ?

c. What would be the answer to questions a and b in the case of a constant electric field ? Would it be different for a non-relativistic particle ?

d. Show that the case consider in 3 is just a particular case of the more general problem of radiation by a uniformily accelerated particle, as the one considered in problem set 1.

e. How can one interpret the results obtained in 3.a and 3.b ?

f. Compare the results obtained in class with Jackson, 16.9 (b).