

## Physics 836: Problem Set 2

Due Wednesday, April 20, 2005

1. Jackson, Problem 11.5. [In this problem, prove only the second identity, since the first was derived in class. You can start from eq. (11.31).]
2. Consider an infinitely long wire of charge  $\lambda$  per unit length (in its rest frame). The wire moves with speed  $v$  parallel to its length, relative to the lab frame  $K$   
Calculate the magnetic induction  $B$  in the lab frame in two ways:
  - (a) Find the current density in the lab frame from a Lorentz transform, and use Ampere's Law.
  - (b). Find the electric field in the rest frame of the wire and Lorentz-transform the fields.Show that both methods give the same answer.
3. Write out Jackson (11.141) and (11.143) and show that they give the Maxwell equations (i. e. the eight scalar equations which make up the Maxwell equations).
4. Jackson, problem 11.15
5. Jackson 11.14 (a), (b).