

**Additional Problem Set I**

1. (a) Prove Kelvin's Theorem for an ideal, isentropic fluid two different ways.  
  
(b) Show what happens to Kelvin's Theorem in an MHD fluid. You may assume  $P = P(\rho)$ .
2. Derive Ertel's Theorem — the counterpart of Kelvin's Theorem for a non-isentropic fluid.
3. (a) Work out the details of the energy conservation demonstration discussed in class. Show all cancellations.  
  
(b) What does the energy conservation relation look like for a blob of ideal incompressible MHD fluid? Explain.
4. Show that cross helicity is conserved in ideal MHD.