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.