CSI 769 Fall 2010
Solar and Heliospheric Physics

Homework Assignment 5

Assignment Date: Oct. 23, 2010
Due Date: Oct. 28, 2010

1. **2-D Field**
Consider a 2-D field, in which both magnetic field **B** and flow field **V** have only X and Y components. Starting from the generalized Ohm's law, prove that (1) electric field **E** has only Z component, and (2) **E** is constant across the X-Y plane.

2. **Stagnation-point Flow Model**
Assuming a steady state stagnation-point flow structure in the corona, magnetic diffusivity $\eta = 1\ m^2 s^{-1}$, characteristic flow velocity V_0=10 km/s and characteristic size of the flow field a=10000 km. Further assuming at the boundary of the current sheet (x=L), B=1000 Gauss.
(1) Calculate the half width of the resulted current sheet L?
(2) Calculate the constant electric field in this model?
(3) Calculate the strength of magnetic field and current density at the center x=0?
(4) Calculate the strength of magnetic field and current density at x=L/2?
(5) Calculate the strength of current density at x=L?
(6) Calculate the strength of magnetic field and current density at x=2L?
(7) Calculate the strength of magnetic field and current density at x=10L?

Note: You need to numerically calculate the Dawson integral function.