Homework due March 6

1. Read all of sections 5.1, 5.2.

2. A charged particle moves in uniform electric and magnetic fields which are at right angles to each other. Given an initial position and velocity derive the coupled differential equations which describe the motion. Choose initial conditions of interest to you and solve for the motion using Mathematica (include your code).

3. Chapter 5 problems 2, 5, 6, 9.

4. Semi-infinite conducting planes $\phi = 0$ and $\phi = \pi/6$ are separated by an infinitesimal insulating gap. Let $V(\phi = 0) = 0$ and $V(\phi = \pi/6) = 100$ Volts. Assume that V depends only on ϕ and use cylindrical coordinates (z axis at the gap and perpendicular to the page).

   (a)Find both $\vec{E}$ and V in the region between the plates.

   (b) Now that the problem is solved, why can you say that the assumption that V depends only on ϕ was correct?

   (c) Explain how you would find the capacitance for two conducting plates each of 1 m^2 area if the plates are in the geometry of the semi-infinite conducting planes above. Assume that the field is that given in part (a) and that the plates are separated by a gap of negligible width.