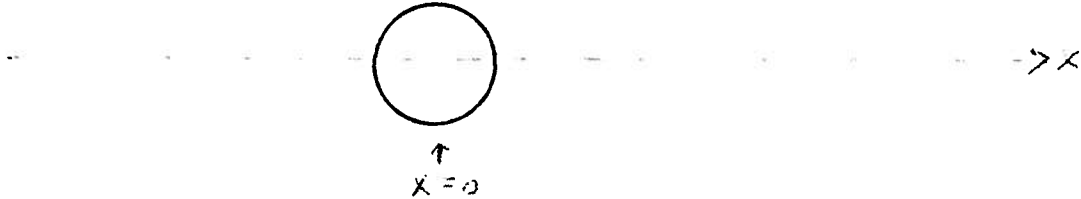


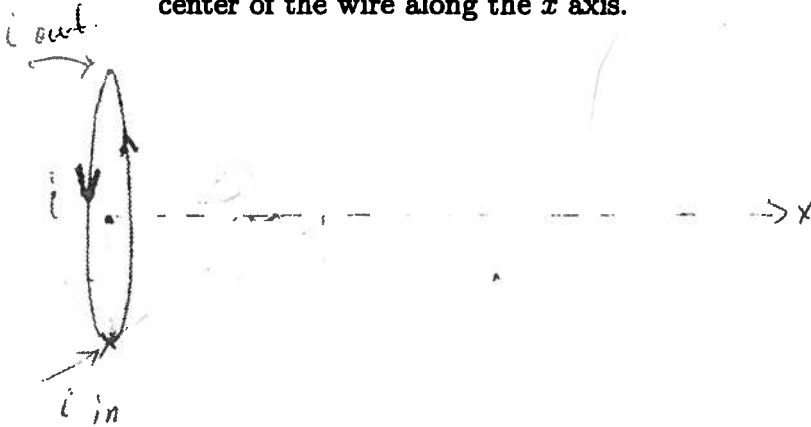
1. (25 points) An infinitely long wire carrying a current i has a circular cross section of radius W . The current is uniformly spread over the cross sectional area. If the center of the wire is at the origin, find the points on the x axis where the magnetic field has one half the magnitude of the magnetic field at the surface of the wire.

i (into page)

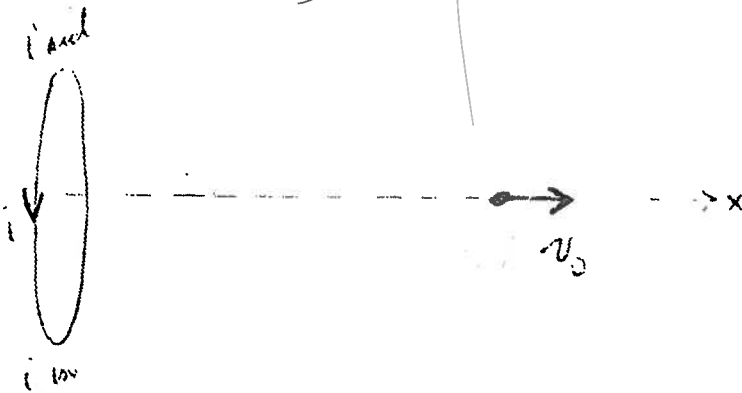


2. (25 points) A circular loop of very thin wire has radius R and carries a current i . It is in the y, z plane with its center at the origin.

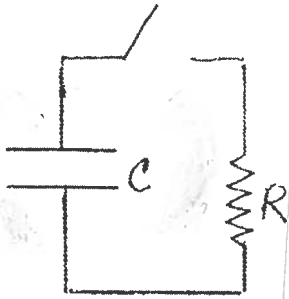
a. Find the magnetic field produced by this wire at a point a distance x away from the center of the wire along the x axis.



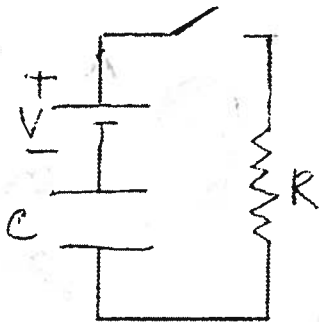
b. Find the force that would be exerted by this current carrying wire on a particle with charge q and mass m travelling with velocity v_0 at the point a distance x from the center.



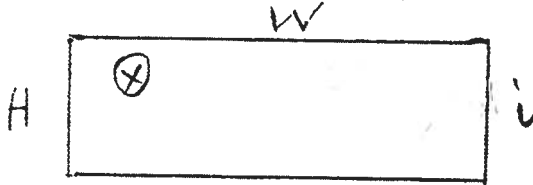
3. (25 points) In the circuit below the capacitor is originally charged with Q_0 on the top plate and $-Q_0$ on the bottom. At $t = 0$ the switch is closed.
- a. Find the charge on the plates as a function of time assuming the self inductance of the circuit can be ignored. Please note that all wires in this circuit have no resistance.



- b. In the circuit below the capacitor is initially uncharged. At $t = 0$ the switch is closed. Find the charges on the capacitor plates as a function of time assuming the self inductance of the circuit can be ignored.



4. (25 points) A rectangular loop is made of wire having resistivity ρ and cross sectional area A . It has the dimensions shown below.



If there were a magnetic field that varied with time according to

$$B = 6t^4 + 7t + 11$$

and was directed perpendicular to the loop, pointing into the page, find the current that would flow in the loop, ignoring self inductance.