129A HW # 3 (due Sep 26)

Read the paper by C. D. Anderson, *Phys. Rev.* **43**, 491 (1933), 1st page. This is the Nobel prize paper which reported the discovery of the positron, the anti-particle of electron. He used a cloud chamber to record tracks of electrically charged particles. There is a magnetic field applied so that one can measure the momentum of the particle from the curvature of tracks.

1. Show that a particle with charge e draws a trajectory that is a circle of radius $|\vec{p}|/(e|\vec{B}|)$. Use the (relativistic) equation of motion, $d\vec{p}/dt = e\vec{v} \times \vec{B}$, where $\vec{B}$ is the magnetic field.

2. Fig. 1 is the first event in his cloud chamber which he believed to show a track of a positron. In order to know the charge of the particle from the way the track curves, he needed to know whether the particle has come from above or below. How do we know that the particle has come from below, even though typical cosmic ray particles come from above? The figure caption gives you a hint.

3. Why could he conclude that the track is not that of a proton?

4. How did he argue that the tracks above and below the lead plate cannot be those of two different electrons?