

HW#2

Due 2023/10/18

- 1.(a) Determine the trajectory of a particle of mass m and charge q in uniform fields $\vec{E} = E_x \hat{x}$ and $\vec{B} = B_z \hat{z}$ with the initial velocity $\vec{v} = v_0 \hat{y}$, where $v_0 = v_{gyro} + v_{ExB}$.
(b) Discuss and sketch the trajectories for the cases of $v_{gyro} > v_{ExB}$ and $v_{gyro} < v_{ExB}$.

2. Suppose the Earth's magnetic field strength in the equatorial plane is given by $B = B_0 (R_E/r)^3$, where $B_0 = 0.3$ G, R_E is an earth radius, and r is the geocentric distance.
(a) Estimate the drift velocity and period for both a proton and an electron of 10 keV with a pitch angle 90° at $5 R_E$ in the equatorial plane.
(b) Compare answer (a) with the period of gravitation drift for the same particles.