P.6-2 $\quad \dfrac{\partial \bar{u}}{\partial t} = -\dfrac{e}{m}(\bar{E} + \bar{u} \times \bar{B})$.

a) $\bar{E} = \bar{a}_z E_0, \quad \bar{B} = \bar{a}_x B_0$.

$$\left.\begin{aligned} &\frac{\partial u_x}{\partial t} = 0, \\ &\frac{\partial u_y}{\partial t} = -\frac{e}{m} B_0 u_z, \\ &\frac{\partial u_z}{\partial t} = -\frac{e}{m}(E_0 - B_0 u_y). \end{aligned}\right. \longrightarrow \left\{ \begin{aligned} &u_x = 0, \\ &u_y = \left(u_0 - \frac{E_0}{B_0}\right)\cos\omega_0 t + \frac{E_0}{B_0}, \\ &u_z = \left(\frac{E_0}{B_0} - u_0\right)\sin\omega_0 t; \quad \omega_0 = \frac{e}{m}B_0. \end{aligned}\right.$$

If the electron is injected at the origin $(x=y=z=0)$ at $t=0$:

$$x = 0, \quad y = \frac{c_2}{\omega_0}\sin\omega_0 t + \frac{E_0}{B_0}t, \quad z = -\frac{c_2}{\omega_0}(1-\cos\omega_0 t); \quad c_2 = u_0 - \frac{E_0}{B_0}.$$

Eq. of motion: $\left(y - \dfrac{E_0}{B_0}t\right)^2 + \left(z + \dfrac{c_2}{\omega_0}\right)^2 = \left(\dfrac{c_2}{\omega_0}\right)^2$.

If $\dfrac{E_0}{B_0} = u_0, \quad u_x = u_z = 0, \quad u_y = u_0$;

$x = z = 0$, and $y = u_0 t$