Problem Set 2

Physics 311
Classical Mechanics I

Due on Friday, September 11th, 2026

Class date: Friday, September 4th, 2026.
Reading: pp. 78-83 – relation between work and energy, pp. 37-40 – gradient operator.

Problem 1

MT 2.34. But instead of finding $v(y)$, find $v(t)$ in each case, i.e. find the velocity as a function of $time$, not displacement.

Problem 2

An electric field of the form $\mathbf{E} = E_0 \sin(\omega t)\hat{\mathbf{z}}$ acts on a charge q (of mass m) that is initially at rest at the origin. What is the position of the charge at time t?

Problem 3

We solved for motion in a uniform magnetic field in class using the centripetal acceleration relation (we knew that the motion occurred with constant speed and with an always-inward-directed force from the start). Try it again working directly from Newton's second law in vector form: For $\mathbf{B} = B_0\hat{\mathbf{z}}$, solve all three components of $m\ddot{\mathbf{r}} = q\dot{\mathbf{r}} \times \mathbf{B}$ with initial conditions $\mathbf{r}(0) = 0$, $\dot{\mathbf{r}}(0) = v_0\hat{\mathbf{x}}$.