PHY 107: Fall 2018

HW 2

Due dates

SECTION 1 and SECTION 2 : NOV 4, 2018
SECTION 3 and SECTION 4 : NOV 5, 2018

NOTE This is HW 2 based on the materials from **1D motion** and **Motion in 2 and 3 D**. Please, read each question carefully and answer. You must show all of your working to get full credit. Students can discuss with other students, but each student must submit his/her own work.

Q1

The position of a particle moving along an x axis is given by $x = 12t^2 - 2t^3$, where x is in meters and t is in seconds. Determine (a) the position, (b) the velocity, and (c) the acceleration of the particle at $t = 3$ s. (d) What is the maximum positive coordinate reached by the particle and (e) at what time is it reached?

Q2

An electric vehicle starts from rest and accelerates at a rate of 2 m/s^2 in a straight line until it reaches a speed of 20 m/s. The vehicle then slows at a constant rate of 1 m/s^2 until it stops. (a) How much time elapses from start to stop? (b) How far does the vehicle travel from start to stop?

Q3

Part 1 (a) With what speed must a ball be thrown vertically from ground level to rise to a maximum height of 50 m? (b) How long will it be in the air?
Part 2 A particle's acceleration along an x axis is $a = 5t$, with t in seconds and a in meters per second squared. At $t = 2$ s, its velocity is 17 m/s. What is its velocity at t = 4 s?

Q4

A particle moves so that its position (in meters) as a function of time (in seconds) is $\vec{r} = \hat{i} + 4t^2\hat{j} + t\hat{k}$. Write expressions for (a) its velocity and (b) its acceleration as functions of time.

Q5

A small ball rolls horizontally off the edge of a tabletop that is 1.20 m high. It strikes the floor at a point 1.52 m horizontally from the table edge. (a) How long is the ball in the air? (b) What is its speed at the instant it leaves the table?

Q6

A projectile is fired horizontally from a gun that is 45.0 m above flat ground, emerging from the gun with a speed of 250 m/s. (a) How long does the projectile remain in the air? (b) At what horizontal distance from the firing point does it strike the ground?

Q7

A ball is shot from the ground into the air. At a height of 9.1 m, its velocity is $\vec{v} = (7.6\hat{i} + 6.1\hat{j})$ m/s, with $\hat{i}$ horizontal and $\hat{j}$ upward. (a) To what maximum height does the ball rise? (b) What total horizontal distance does the ball travel?