Project II

Due Thursday, July 28, 2016

Write a program to solve the following projectile problem by using the 4-th order Runge-Kutta method. The object has a mass m=30 kg, an initial speed v_0=100 m/s, and an angle θ_0 to the horizontal. Moreover, the object is subject to an air-friction force $F=-kv^2$, where $k=5.0\times10^{-2}$ SI unit, and v is the instant speed. The negative sign indicates that the force is in the opposite direction of the instant velocity.

1) Convert the problem into the standard form and write (or modify) a code to solve it.
2) plot the x-y projectile trajectories for θ_0 =30^o, 45^o, 60^o separately (at first, *estimate* the total flying time by using the ideal case values); plot the non-friction case on the same graph for comparison.
3) try different firing angles to find the maximum range (R), and just report the angle (no plot), within 1^o error range.

Suggestion: take the step size h=0.02 sec.

In General, a project format:

1. Analysis
   What is the problem? Which algorithm is adopted? If necessary, derive the formula(s) used in the code.
2. Flow chart;
   A link of your code.
3. Results (graphs and numbers) and discussion.