

Computational Physics / PHYS-UA 210 / Problem Set #11
Due November 22, 2019

You *must* label all axes of all plots, including giving the *units*!!

1. Exercise 8.3 of Newman.
2. Write a routine that integrates the equations for projectile motion:

$$\frac{d^2 \vec{x}}{dt^2} = -g \hat{x}_1 - \alpha \dot{\vec{x}}^2, \quad (1)$$

where \hat{x}_1 is the vertical direction. These are appropriate for, say, a golf ball. The initial conditions should be that the object is launched at some angle θ from the horizontal at some initial speed in the x_0 - x_1 plane. Integrate until the object hits the ground again. Use a Runge-Kutta method from `scipy` to solve this problem and write a routine that finds where the ball hits the ground again.

3. Use Brent's method (either yours or `scipy`'s) to optimize the angle θ to get the longest distance.
4. Exercise 8.10 of Newman.