Project 6 - Initial Value Problems - Part A

Due Friday 3-1

Use the initial value problem paradigm (way of looking at the problem) discussed in class to solve these mechanics problems.

1. Consider the case of a 1 kg ball dropping from a height of 1 m. Determine the time it takes to hit the ground. Answer this question in the comment area: What timestep is needed to reduce the error to 0.0001 seconds?

2. Consider the case of a 1 kg ball dropping from a height of 1 m. Determine the time it takes to hit the ground. Assume an air drag model of $F_D = -2v$ N.

3. Consider the case of a ball dropping from a height of 1 m. Determine the time it takes to hit the ground. Assume an air drag model of $F_D = 2v^2$ N.

4. Last fall Austrian 80 kg skydiver Felix Baumgartner (best pronounced with a thick Austrian accent) jumped from a hieght of 40 km above the Earth's surface. Plot Felix's velocity as a function of time and determine his max speed. Use an approximate air drag model of $F_D = 0.1\rho v^2$, where ρ represents the density of the air in kg/m3 which depends on position according to another rough model $\rho = \rho_0 e^{-0.0001x}$. x is in m and ρ_0 1.2 kg/m3. Determine the time it takes to hit the ground.

Place Excel and ONE cpp file containing both parts of this exercise in the P5 dropbox.