Phys. 603 — Classical Mechanics

HW 1 due Tue Jan 24 at 4 p.m. in my mailbox.

Problem

A satellite is put into a circular orbit at radial distance R_0 from the center of the Earth. (The mass of the satellite is negligible in comparison to Earth's mass so one can assume that the satellite orbits around the center of Earth). The thin upper atmosphere of the Earth produces a viscous drag such that the satellite's orbit is observed to decay at a very slow rate. By "slow" we mean that the loss of energy per orbital period is small compared to satellite's total kinetic energy. Moreover, it is observed that the rate of change of the radial distance $\frac{dR}{dt}$ is constant, $\frac{dR}{dt} = -C$ $(C > 0)$. If the viscous drag force on the satellite has the form $\vec{F}(\vec{v}) = -Av^{\alpha}\hat{v}$, obtain expressions or constraints on A and α.