

PHYS 240 homework #8 – due Feb 22 2013, 5:00pm, upload to Canvas

Comet extraordinaire

1. Modify the Keplerian ODE code, `orbit.py`, to both calculate and plot in three dimensions, and to output the trajectory to a “data file”.
2. Create a simplified view of the Solar System, integrating the orbits of both the Earth and a comet. For the comet parameters (relative to the Earth’s), look up a real one on the internet, and make sure it’s one with noticeable orbital inclination (i.e., not coplanar with the Earth’s orbit). Run `orbit.py` for each object, and write a separate script to read in and plot their trajectories together.
3. Modify `orbit.py` to add a drag force on the comet, $\mathbf{F}_d = C|\mathbf{v}|\mathbf{v}$. Take the drag force to be small relative to the gravitational force \mathbf{F}_g by fixing the constant C such that $|\mathbf{F}_g(\mathbf{r}_1)| = 100|\mathbf{F}_d(\mathbf{v}_1)|$, where \mathbf{r}_1 and \mathbf{v}_1 are the initial position and velocity, respectively. Show that the average kinetic energy (averaged over an orbit) *increases* with time.
4. Include any discussions and plots in a report generated in L^AT_EX. Also submit your Python code separately.