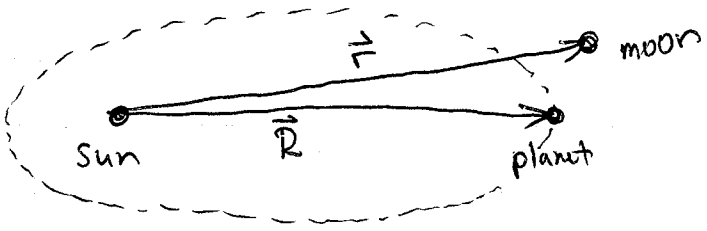
228A Homework 4
due Thursday, Oct 11.

Let $\vec{R} = (X,Y)$, $\dot{\vec{R}} = (U,V)$

$\vec{r} = (x,y)$, $\dot{\vec{r}} = (u,v)$



Solve the ODE

$$\ddot{\vec{R}} = -\frac{\vec{R}}{\|\vec{R}\|^3} + \frac{\vec{r}-\vec{R}}{\|\vec{r}-\vec{R}\|^3} \cdot \frac{1}{8000}$$

$$\ddot{\vec{r}} = -\frac{\vec{r}}{\|\vec{r}\|^3} + \frac{\vec{R}-\vec{r}}{\|\vec{R}-\vec{r}\|^3} \cdot \frac{1}{100}$$

using the 4th order classical RK method and Richardson extrapolation with stepsize control

use $Atol = 10^{-6}$, $Rtol = 10^{-6}$

Try the initial conditions

$$\vec{R}(0) = (5,0) \qquad \dot{\vec{R}}(0) = (0, 0.2)$$

$$\vec{r}(0) = (5.1, 0) \qquad \dot{\vec{r}}(0) = (0, 0.3)$$

plot the trajectory of the planet and moon over one orbit of the planet. Also plot the stepsizes used by your code.