# Ay190 – Worksheet 13 - N-body simulation
## Chatarin (Mee) Wong-u-railertkun
### Date: February 25, 2014

## 1    Earth-Sun system

Using RK4 to perform the integration by Newtonian force for acceleration. If you run the code
`Q2.py`, you can see the 3D simulation of the Earth-Sun system. Also, several information are
also printed, including the iteration, time, and distance between the Earth and Sun. Initially, the
distance is at 1.49599e+13 cm. But the distance is not exactly constant. The distance increases until
it reaches the maximum at 1.49676e+13 cm, when the time is at half the period. Then the distance
decreases back to the initial distance when the Earth completes the full cycle.

## 2    Energy of Earth-Sun system

As time progresses, the total energy is not really preserved. The total energy decreases. Figure 1
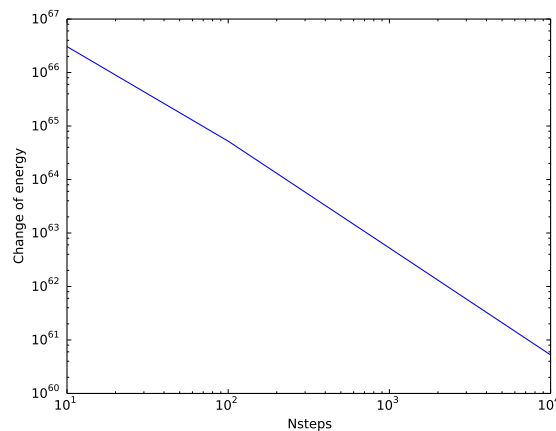shows the convergence of the change in total energy with the resolution.



Figure 1

## 3    Groups of star

Figure 2 shows the change of the energy, i.e. initial energy minus the energy at the time, vs. time.
We can see that the energy is not preserved, but the energy changes with a pattern and periodicity.
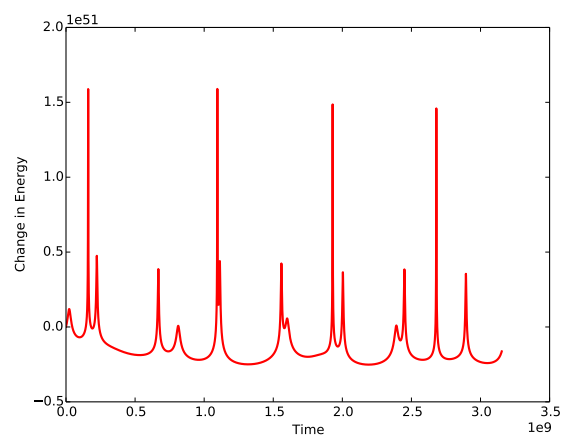
Figure 2