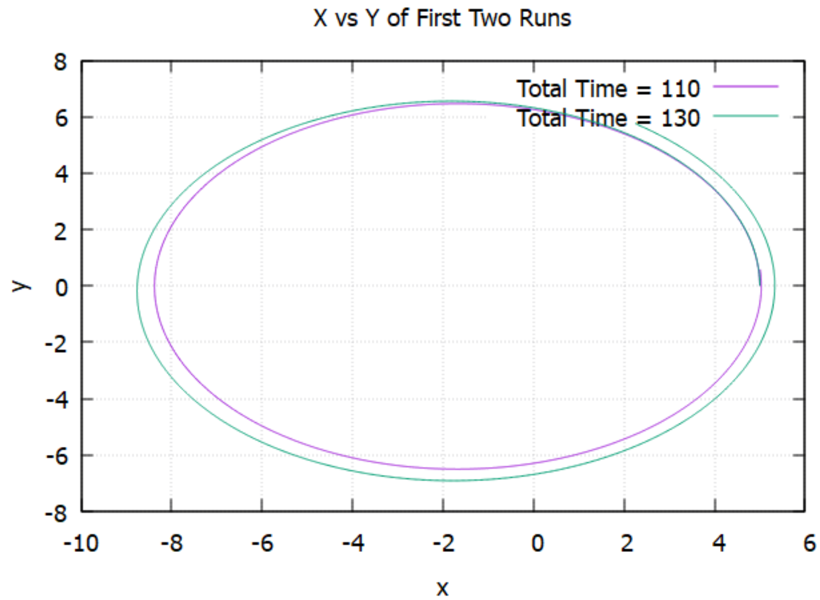
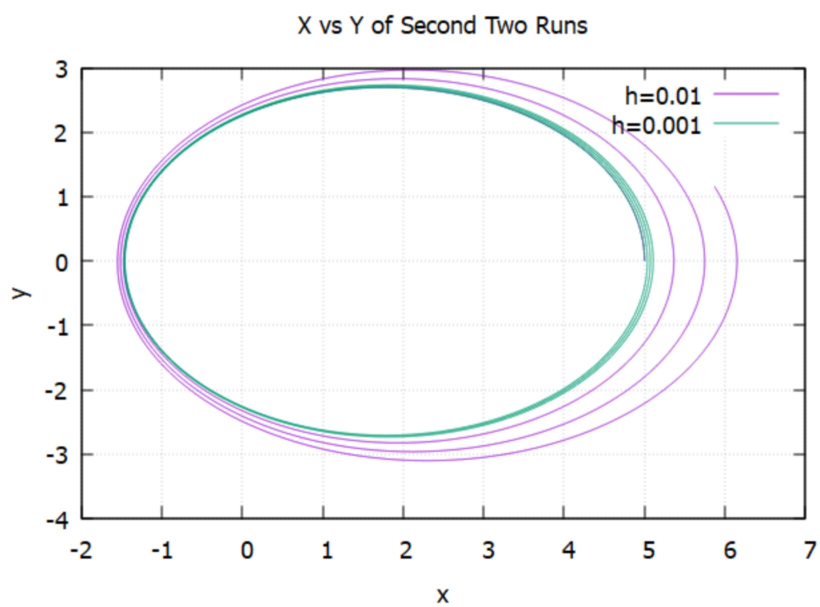
Submission*: Write a report that includes the following:*

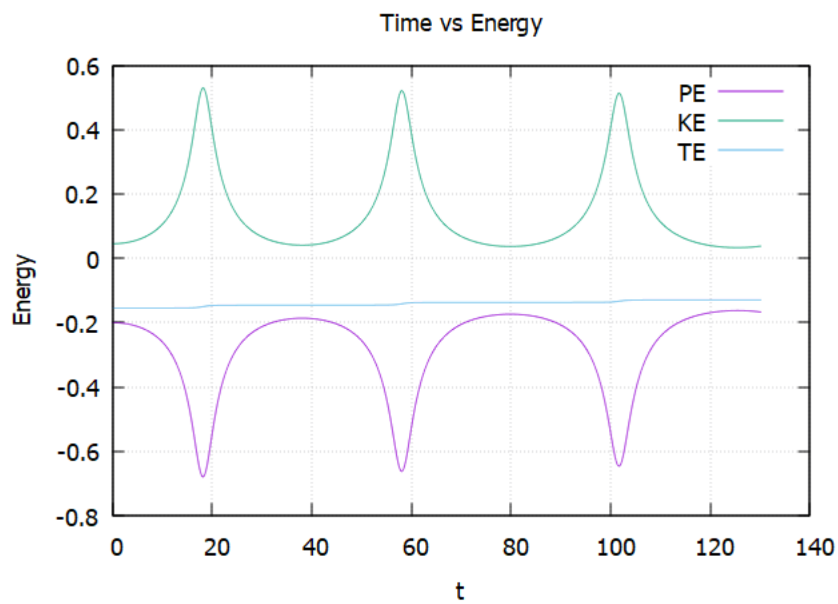
a: Plot the x vs y coordinates of the first two runs on one graph.



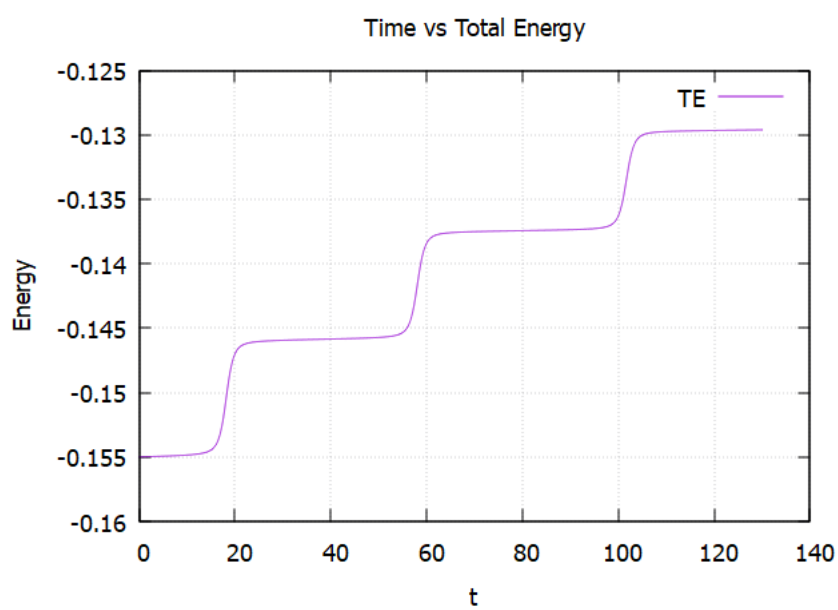
b: Plot the x vs y coordinates of the second two runs on one graph.



c: Plot PE, KE, and Total energy as functions of time for the third run only on one graph.



d: The total Energy looks flat, Plot it by itself third run only on one graph adjusting the yrange (make it really small) of the plot so you can see the steps in it.



e: Answer the following questions:

Could you guess that you would get a bound orbit just from the initial data and why?

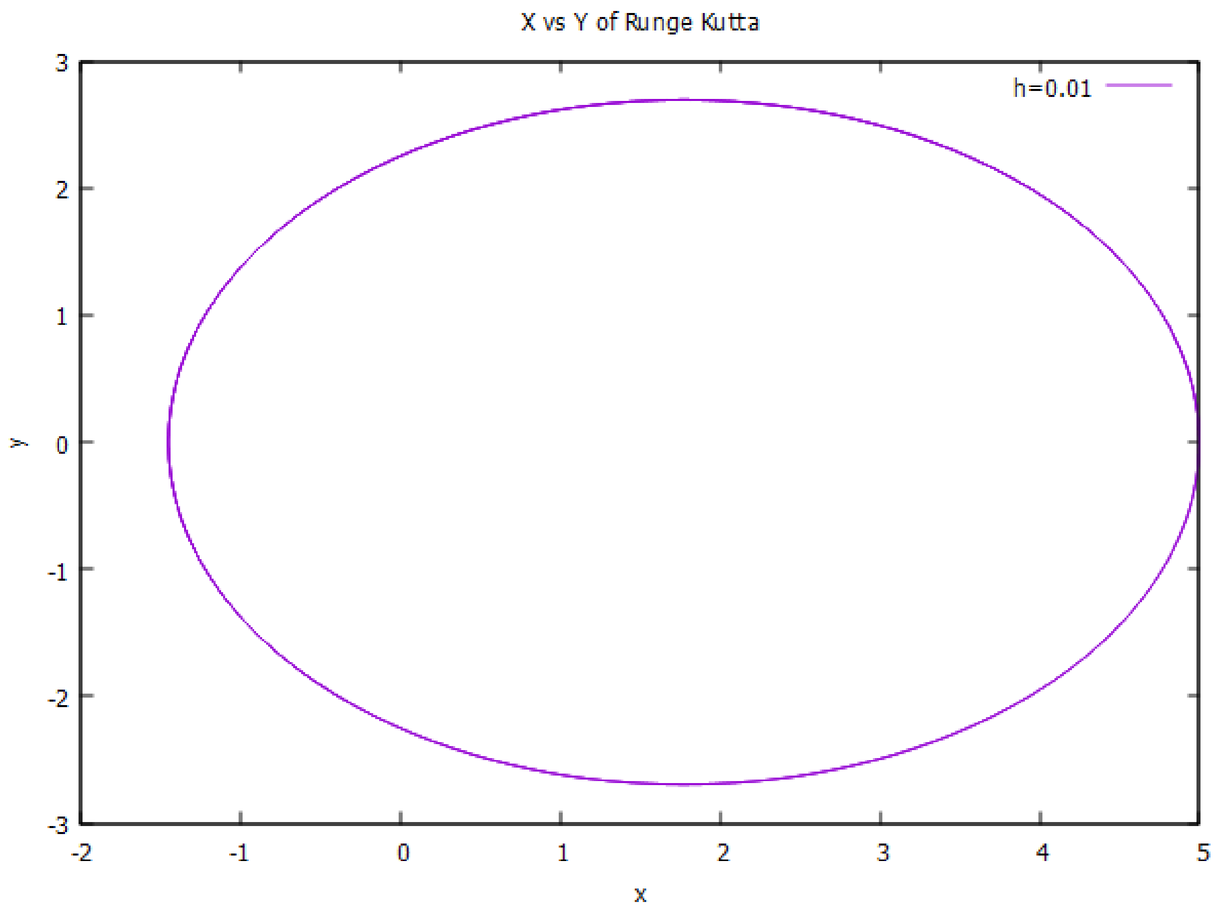
Yes. The initial velocity is small enough that the planet will not escape.

Describe the relationship between KE and PE from the graphs. Why is this?

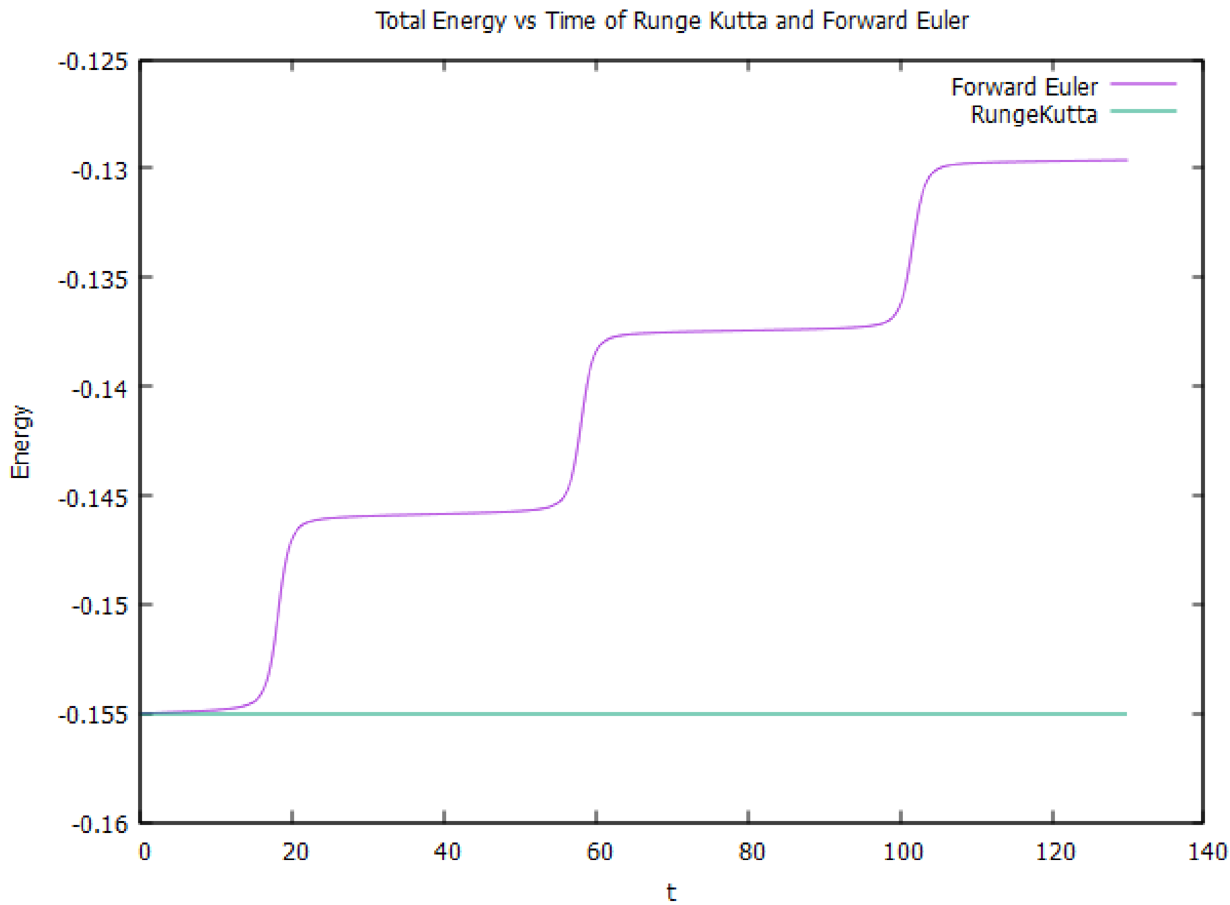
They are inversely proportional to each other, as one goes up the other goes down. This is because total energy is conserved and because Potential Energy is converted into Kinetic Energy and vice versa.

Extra Credit: *Implement Runge Kutta. This only involves changing the Euler step in the do loop. The rest of the program remains the same. However, there are 4 elements we keep track of: x, y, Vx, and Vy. So there are k values for each. The easiest way to do this is with mini arrays for each. k1, k2, k3, and k4 will be arrays of length 4. Run the 3rd case with this.*

Plot the x vs y for this:



Plot the total energy vs time for this case on top of the total energy vs time for the Forward Euler case:



Compare Total Energy change and how 'good' the orbits looks compared with the same case with Forward Euler method:

Runge Kutta has no perceivable change at this scale, compared to forward euler steadily stepping upwards. In addition, the orbits do not seem to spiral out of control, because energy is properly being conserved.