# Lab01

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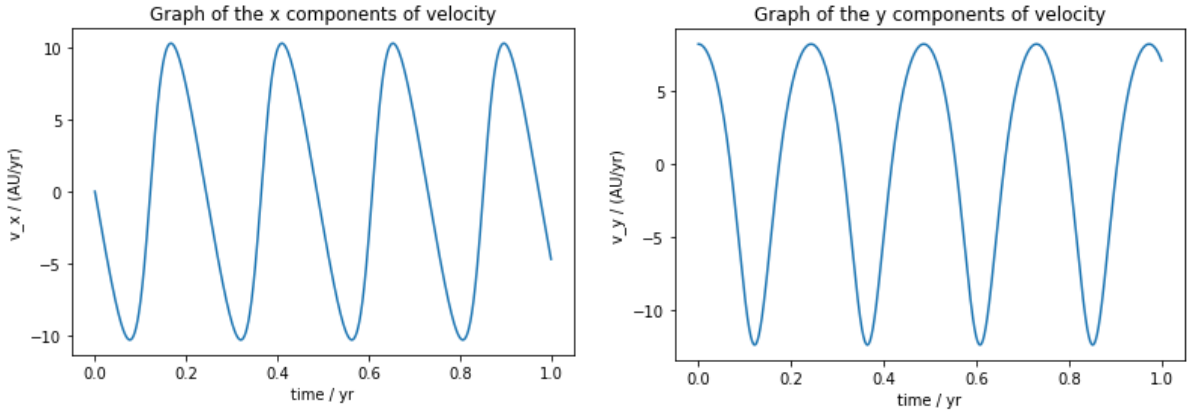
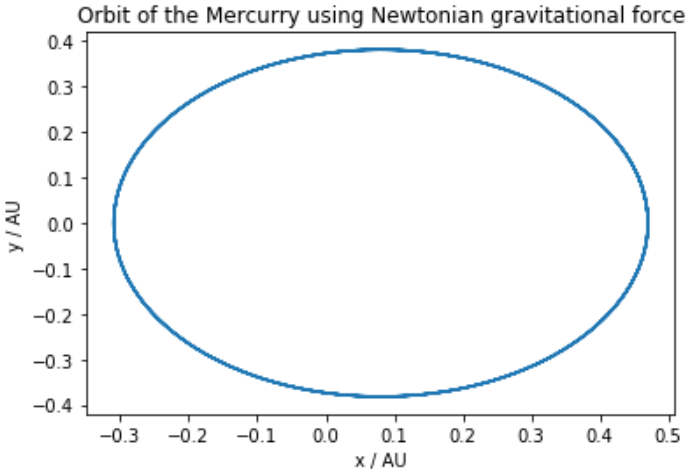
## Question 1. Modelling a planetary orbit

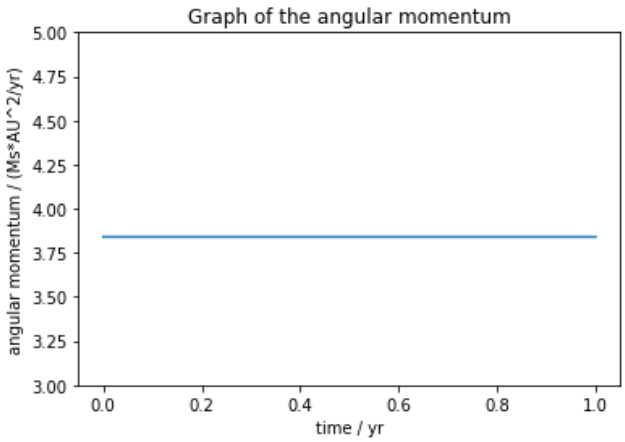
(b) We wrote the pseudo code in the code as comments.

(c)

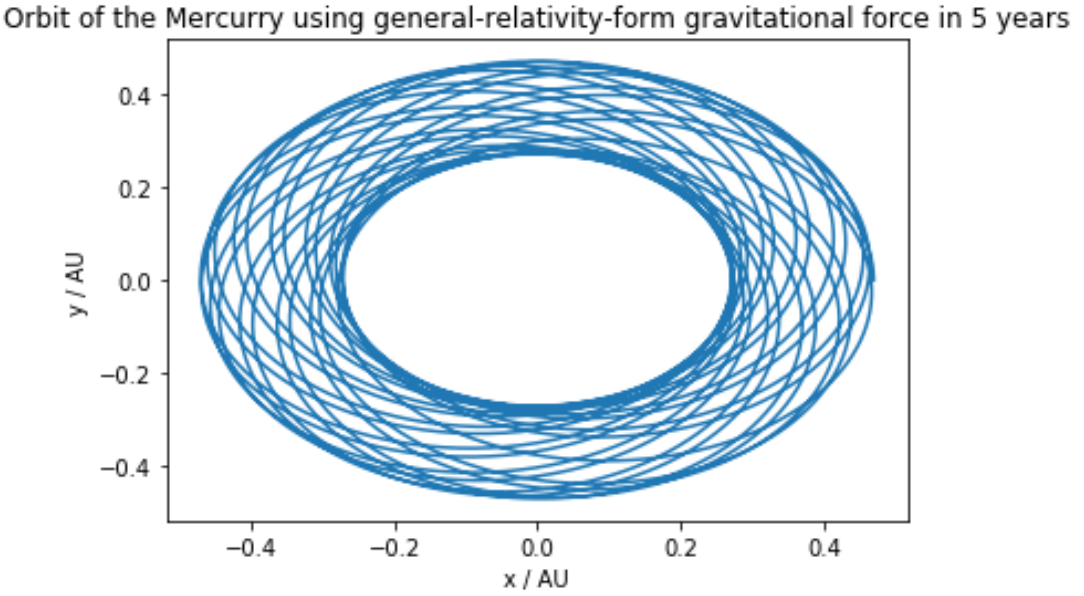


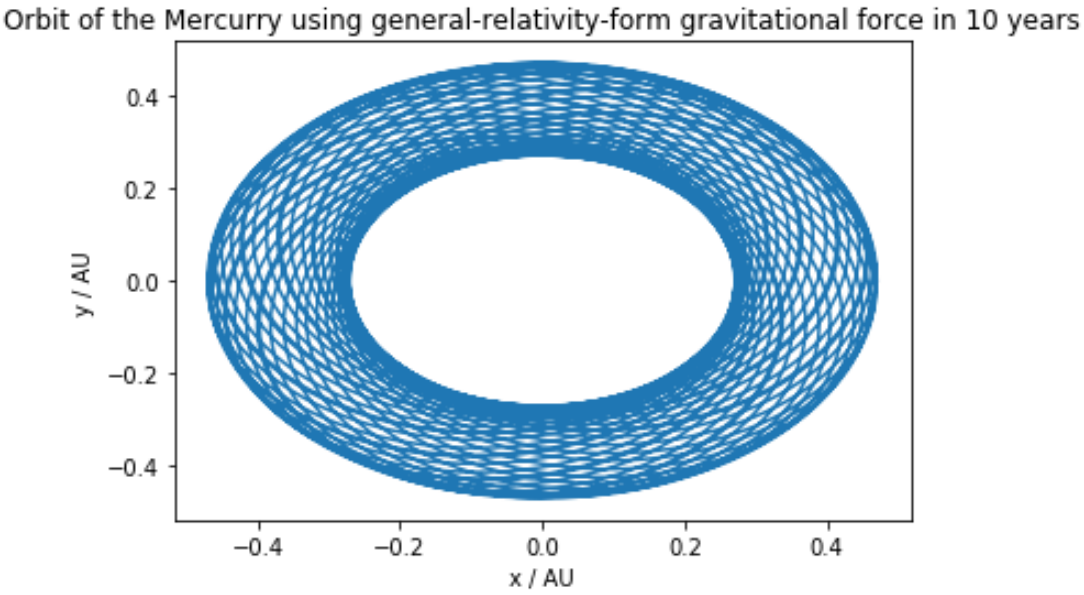




With the initial conditions, by the Euler-Cromer method, we could simulate the orbit of the Mercury which is the elliptical orbit shown above. Then we check the angular momentum, and find the angular momentum is conserved.




(d) Now, we change the numerical integration part into general relativity form. And the orbit of the Mercury is shown below. We can easily see that the perihelion of the orbit moves around in time.

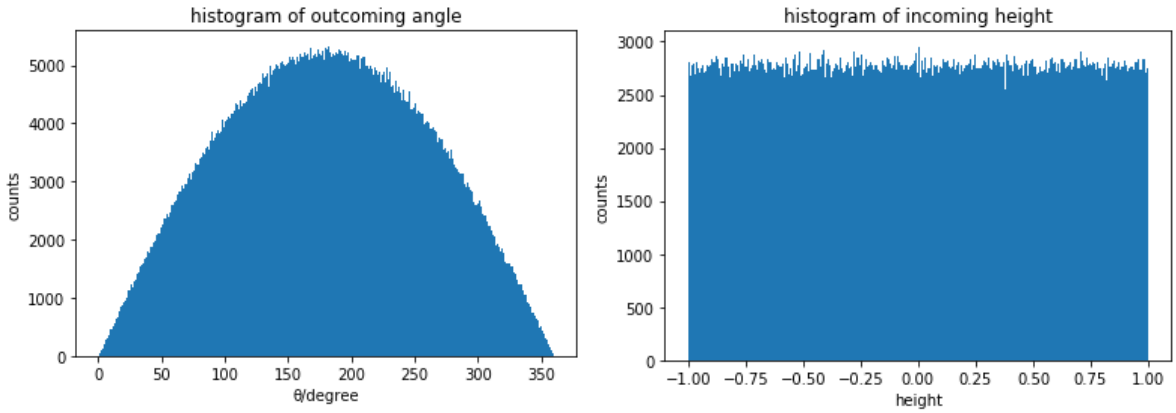


## Question 2. Distribution of scattered particles

(b) We wrote the pseudo code in the code as comments.

(c) The distribution in θ is not uniform, because the function between the height and scattering angle is not linear. The relative probability of a particle in the range 175<θ<190 versus 90<θ<110 is 1.31. And the result is quite stable.




## Question 3. Timing Matrix multiplication

As deploying np.dot into the script, it works extremely more efficient than just one-by-one multiplication.