CSCI 4446 Spring 2019 PS12
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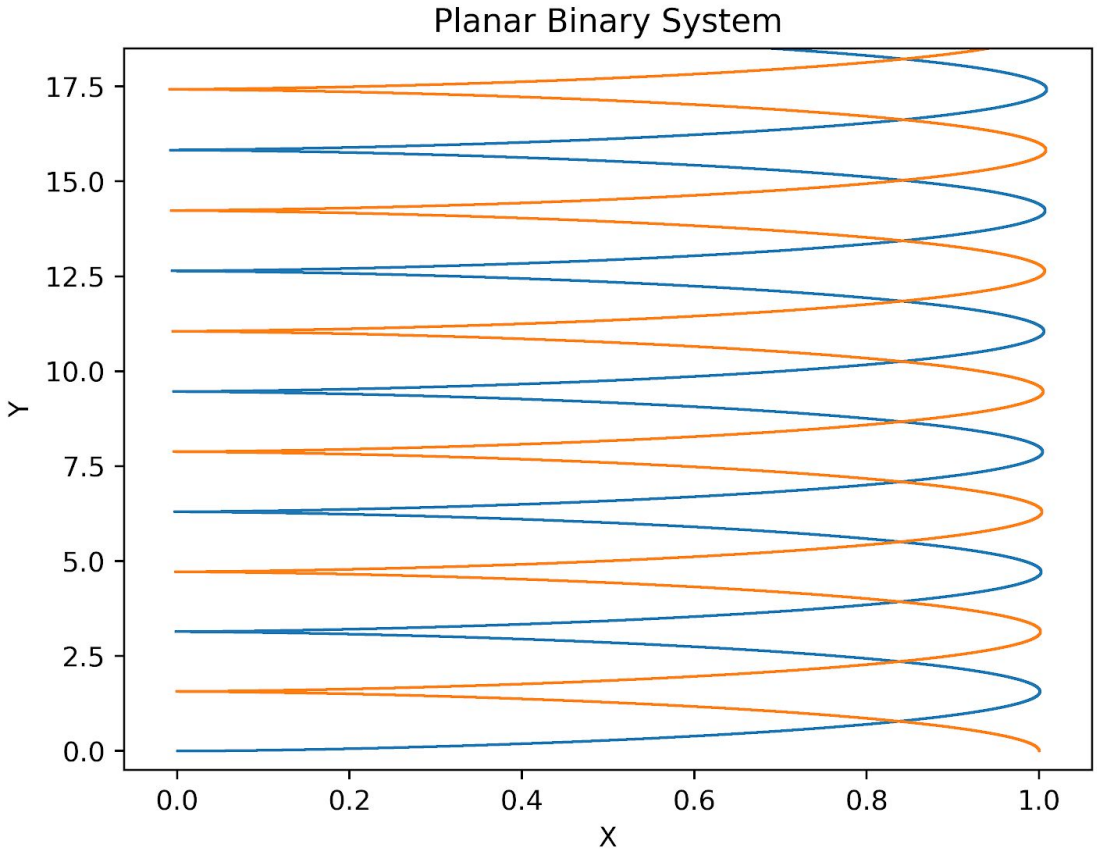
Note: worked with Keegan McNamara

1.

Here is the plot produced by 12D RK4, using the initial conditions found in PS11:



We know the period to be 2π seconds. I used a time step of 0.005, which satisfies the requirement for at least 1000 points per orbit period (2π / 1000 = .00628). To get half a dozen orbits, we'd set our duration to $12\pi \approx 38$. I set it to 40.

It is clear that the stars are moving away from the origin. The center of mass is moving, in the y-direction. This makes sense because the only initial velocity we give to the system is in the y-direction as well, so the whole system dances down that axis. This movement of the center of mass is the reason we never actually see an ellipse. It is similar to holding hands with another person and swinging around each other as you move. There are times when you don't move at all, and you are just swinging the other person. Half a period later, the roles will switch. To better explain this, see a video of this trajectory below:

Real-time video of this binary system (slack/email me for a quick link)
https://drive.google.com/file/d/1hhNBHgE8df0Hppk3iQY1qbO3wZh2lWb3/view?usp=sharing

The binary system is orbiting properly. It is stable, just as our initial conditions from PS11 promised.