Three things learned

- I've read about Kepler's Laws of motion probably a dozen times now through many courses. Equal area equal time, blah blah. So I didn't expect to find a term I hadn't seen before. Even though it's a small thing I've learned, I never knew about the *true anomaly*, or the angle between the planets perihelion and its current position. Had someone mentioned such a term, I would not have connected it to this such angle.
- This is a small one again, so I can't imagine it counts, but I did not know that the sun accounted for 99.8% the mass of the solar system. I knew that this number was huge, but I imagined around 98%. It's just hard to imagine that both Jupiter and Saturn account for 0.2% of the total solar mass. Though that may be due to the fact they are gas giants and are much less dense (at least up until the ”surface”) than Earth.
- Okay, this one is kinda super cool. How have I never heard about Horseshoe orbits before? When I first read page 33-34 of the textbook, I had no idea how to visualize such an orbit, ut after some video simulations on YouTube, I can finally see how it's orbiting like that. I swear I didn't believe this was a thing, and it's kinda crazy that this is a stable orbit??

Two things I want to know more about

- At the start of section 2.2, It mentions that two mutually gravitating bodies are completely integratable. I wanted to google this to understand it better, and learned a bit about what a Degree of Freedom is defined as, since I've never analyzed a system by the number of Degrees of freedom. I don't know
- I wanted to understand why the three body problem was so much more complex than a ”simple” two body problem. After all, with the mass of the sun being 99.8% of the solar system, can't you approximate it to a one body problem? If so, then why can't you approximate 3 to 2 and solve that way? I found a lot of resources on the topic, it seems like a well covered problem, though the math used for it was much more complicated than I had expected.

Create one question not answered in the text

I understand Lagrangians enough to know that they are simply the Kinetic Energy minus the Potential energy of a system, and the math regarding this seems to tie in together Hill Spheres, the Lagrangian points, Horseshoe orbits, the solar system Trojans, and many more satellite behavior. Why is this the case, and is it possible to explain this with the 2nd year math we have? It almost feels like a whole section of orbital dynamics is “locked” behind more math, when I thought orbital dynamics was something solved by Newton and Kepler centuries ago.