Announcements

- Midterm
  - Due date next Tuesday night in case you are having to travel or move
  - Gradescope assignment posted for it, so turn it in when you can!
- Grading
  - Clearly, I haven't managed to catch up with all the recent events.
  - If you need feedback on something you turned in but haven't gotten back yet, let me know exactly what it is and I'll try my best to get you some feedback
- I'm going to go ahead and leave HW8 due the Monday after Spring Break. It is only 3 problems and 2 are pretty fast, so you can leave it till the weekend before if you want.
- Info will go out over break about final project/paper options
- Responses: `rembold-class.ddns.net`

Today's Objectives

- Be able to determine orbital parameters from various bits of information
- Understand how Hohmann transfers work and determine the necessary thrust factors
- Identify other properties of orbits and determine them from the orbital elements

Q1

Why do we add a δ orbital parameter when talking about more than 1 orbit?

A) δ is the relative phase between the two orbits, and so requires more than 1 orbit.

B) δ is a rotation of the orbit, and two orbits are not guaranteed to have the same rotation.

C) δ gives us the small amount of separation between two orbits.

D) δ gives us the starting position of the object, and two objects are not guaranteed to have started in the same position.

Solution: δ is a rotation of the orbit, and two orbits are not guaranteed to have the same rotation.

Q2

Suppose we fire our rockets tangentially forwards when we are at perigee such that we double our speed. If we were originally in an elliptical orbit with $\epsilon = 0.5$, what type of orbit are we now in?

A) Still elliptical
B) Circular
C) Hyperbolic
D) Impossible to tell just from this information

Solution: Hyperbolic

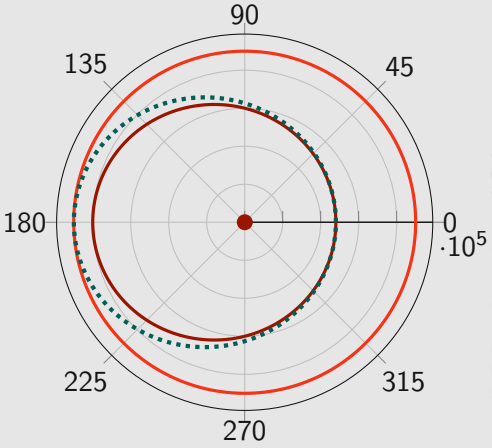
Q3

Suppose you are in the elliptical orbit shown to the right, given by

$$r(\phi) = \frac{6000\,\text{km}}{1 + 0.25\cos(\phi)}$$

but you want to move to the circular orbit shown, where $c = 9000\,\text{km}$. What thrust factor would be needed to set yourself onto the intial transfer orbit?

A) 0.978
B) 1.0215
C) 1.234
D) 2.34



Solution: 1.0215

Q4

So we know by what factor we'd need to increase our speed, but how fast were we going in the first place? Suppose we were in a 1000 kg ship orbiting Earth (6×10^{24} kg). As a reminder:

$$r(\phi) = \frac{6000\,\text{km}}{1 + 0.25\cos(\phi)} \quad \text{and} \quad G = 6.67 \times 10^{-11}$$

A) 1.36 km/s
B) 1.50 km/s
C) 6.82 km/s
D) 8.12 km/s

Solution: 8.12 km/s

Q5

Once we are on the transfer orbit, how long would we need to wait before we got to our desired orbit?

A) 24.6 min
B) 47.4 min
C) 94.8 min
D) 314.1 min

Solution: 47.4 min