Announcements

- HW8 posted! Just 3 problems.
- Grading
  - I'm a bit behind at the moment, but have needed to spend this week catching up my Python course
  - I'm aiming to get you feedback about the Midterm by the end of next week.
- Info will go out over the weekend about the final chapter options
- Read through 9.3 for Friday
- Responses: `rembold-class.ddns.net`

Today's Objectives

- Understand and describe the various possible shapes of orbital motion
- Make energy arguments to understand if an orbit is bound or not
- Be able to determine orbital parameters from various bits of information
- Understand how Hohmann transfers work and determine the necessary thrust factors

Q1

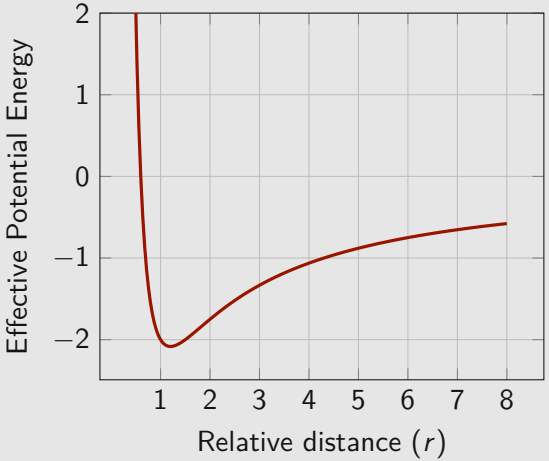
Suppose you have a collection of 2 kg objects in the gravitational field shown to the right. Each is located at a different radial distance and with a different radial velocity. Which are in unbound orbits?

Obj 1: $r = 0.5, \quad \dot{r} = 2$

Obj 2: $r = 1, \quad \dot{r} = 1$

Obj 3: $r = 4, \quad \dot{r} = 0$

Obj 4: $r = 6, \quad \dot{r} = 1$



A) Only 1

B) Only 1 and 4

C) Only 2 and 3

D) All of them

Q2

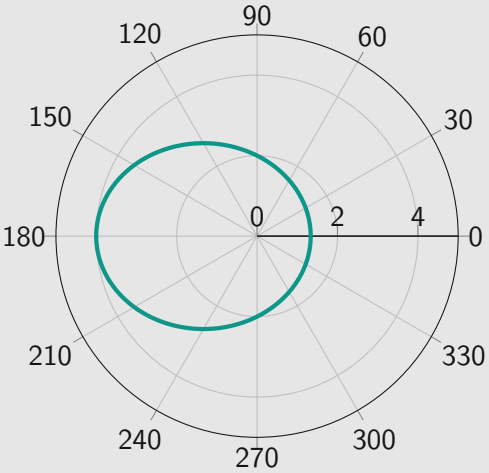
Suppose you have a central force given by:

$$F = \frac{k}{r(\phi)^3}$$

where k is a positive constant. What form would the general solution to $u(\phi)$ take?

A) Oscillatory
B) Exponential growth
C) Exponential decay
D) A constant

Q3



Which solution below would give the orbital motion shown in the plot to the left?

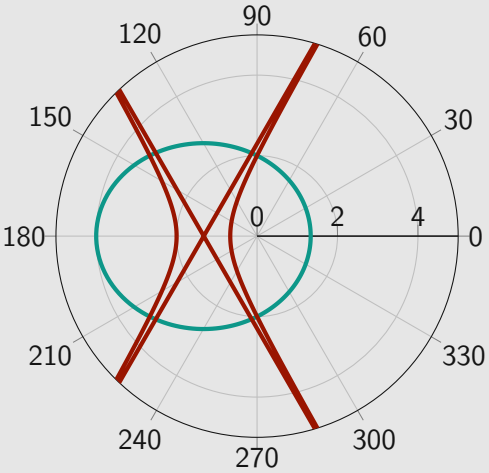
A) $\dfrac{2}{1-2\cos\phi}$

B) $\dfrac{1}{1+2\cos\phi}$

C) $\dfrac{2}{1+\frac{1}{2}\cos\phi}$

D) $\dfrac{1}{1+\cos\phi}$

Q3



Which solution below would give the orbital motion shown in the plot to the left?

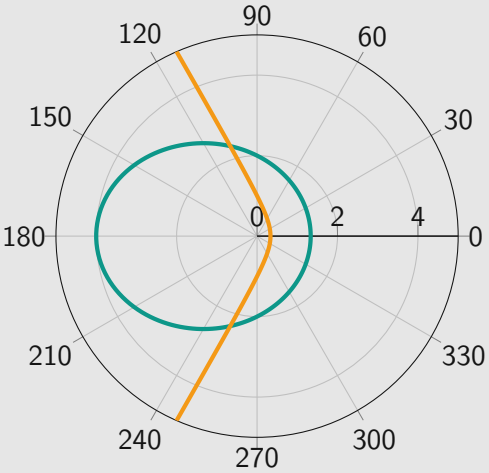
A) $\dfrac{2}{1-2\cos\phi}$

B) $\dfrac{1}{1+2\cos\phi}$

C) $\dfrac{2}{1+\frac{1}{2}\cos\phi}$

D) $\dfrac{1}{1+\cos\phi}$

Q3



Which solution below would give the orbital motion shown in the plot to the left?

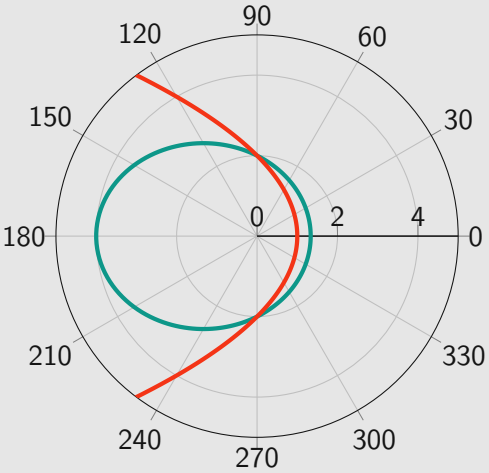
A) $\dfrac{2}{1-2\cos\phi}$

B) $\dfrac{1}{1+2\cos\phi}$

C) $\dfrac{2}{1+\frac{1}{2}\cos\phi}$

D) $\dfrac{1}{1+\cos\phi}$

Q3



Which solution below would give the orbital motion shown in the plot to the left?

A) $\dfrac{2}{1-2\cos\phi}$

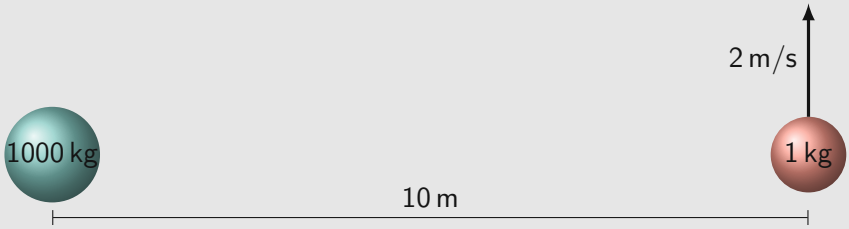
B) $\dfrac{1}{1+2\cos\phi}$

C) $\dfrac{2}{1+\frac{1}{2}\cos\phi}$

D) $\dfrac{1}{1+\cos\phi}$

Q4

Suppose you have two objects as shown below in a world where $G = 1$ but otherwise the laws of gravity look the same. What type of "orbit" will the red object have about the teal?



A) Circular
B) Elliptical
C) Parabolic
D) Hyperbolic

Q5

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.

Q6

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