

Astronomy 105G
Lab Review Session 2

In collaboration with your Lab Group members, please answer each of the following questions in writing, and be prepared for one group member to turn the answers in on behalf of the entire group.

1. (M2.02) Newton's First Law states that an object that is at rest will remain at rest unless acted upon by *an outside force*. Suppose that you stand up from your chair and start walking forwards. Please explain what *outside force* causes you to begin moving (note: your legs and anything that they do are not an outside force!).
2. (M2.03) Orbital motion
 - Write down a description of Newton's Cannball thought experiment that anyone could understand.
 - As the tower that the cannon is mounted up on is built higher, how does the force of gravity at the top of the tower change?
 - Now suppose that the cannon always fires the cannonball at just the right speed so that the lateral ("sideways") motion counters the falling motion. How does the required lateral speed change with the tower's height?
 - Now let's apply this to the planets: Do planet that are farther from the Sun move faster in their orbits or slower? Does their speed depend on their mass?
3. (M2.06) Suppose that, while the moon is in its last-quarter phase, you point one arm at the Sun and the other at the Moon. What is the angle between your arms? Use this observation to explain how the "shadowed" portion of the Moon cannot be in the Earth's shadow; that is, the Moon's phases cannot owe to the Moon passing through the Earth's shadow.
4. (M2.08) Sketch what the Sun-Moon-Earth system looks like during a lunar eclipse. A lunar eclipse occurred on January 31 2018. I wanted to see another one in the following March. Why was that impossible?
5. (M2.12) Shortly after the Moon formed, it may have rotated counterclockwise (as viewed from a point above Earth's North Pole) such that it spun around on its axis many times for each time that it orbited the Earth. If the Moon was molten at the time, it would have had tidal bulges. Illustrate the Earth-Moon system at this time and explain how:
 - the Earth's gravity gave rise to the Moon's tidal bulges;
 - the gravity between the Earth and those tidal bulges changed the Moon's rotational speed.