

Physics 131: Survey of the Universe
Spring 2003-2004
Prof. Michael S. Vogeley
Homework assignment 2

Due at the beginning of class, 12:30 p.m., Thursday, April 15. Please write your work and answers on a separate sheet of paper, with your name at the top and all pages stapled together.

1. Galileo and his telescope

Describe in one or two sentences how each of these observations by Galileo provided evidence against the geocentric model:

- (a) Moons of Jupiter
- (b) Phases of Venus

2. Gravity on other planets

How much stronger or weaker is gravity on the surface of other planets? You can figure this out just by using *ratios*. You don't need to compute the force $F = Gm_1m_2/r^2$, you only need to look at the ratio $F_{\text{otherplanet}}/F_{\text{Earth}}$, which depends on the radii and masses of the two planets.

- (a) Venus
- (b) Pluto
- (c) Saturn (assume here that there is a platform at the planet's "surface" that you could stand on)

3. Astronomers throughout the ages

- (a) Place the following famous philosophers, mathematicians, and astronomers in historical order (by birthdate): Newton, Aristarchus, Kepler, Brahe, Aristotle, Galileo, Copernicus, Ptolemy
- (b) Divide the names above into two lists, according to which model of the universe they espoused: geocentric or heliocentric

4. Keplerian orbits

- (a) What is the orbital period of a planet in an orbit with a semi-major axis of 4 A.U.?
- (b) What is the average velocity, in kilometers per second, of that planet? (you may use the approximation that the orbit is roughly circular, with circumference $C = 2\pi a$)

5. Aboard Spaceship Earth

- (a) How fast, in kilometers per second, does the Earth orbit around the Sun? Compare that speed to that of a car on the highway (assume that you travel at 60 miles per hour and be sure to convert to the same units to compare!).
- (b) How fast, in kilometers per second, does the Earth's rotation cause you to move as it spins on its axis (make the approximation that you're at the equator)?