Physics 167 – Astronomy

Homework #2

Chapter 3

1. You are an astronomer on planet Nearth, which orbits a distant star. It has recently been accepted that Nearth is spherical in shape, though no one knows its size. One day, while studying in the library of Alectown, you learn that on the equinox your sun is directly overhead in the city of Nyene, located 1000 km due north of you. On the equinox, you go outside in Alectown and observe that the altitude of your sun is 80°. What is the circumference of Nearth? (Show all calculations.)

2. The dwarf planet Eris orbits the Sun every 557 years. What is its average distance (semimajor axis) from the Sun? How does its average distance compare to that of Pluto? (Find the ratio of the distance to that of Pluto.) You can find orbital data on all the planets (and some dwarf planets) in Appendix E of the text.

Chapter 4

3. Find the orbital period for the planet in each of the cases below:
a. A planet with twice Earth's mass orbiting at a distance of 1 AU from a star with the same mass as the Sun.
b. A planet with twice Earth's mass orbiting at a distance of 1 AU from a star with four times the Sun's mass.

4. a. Find Earth's approximate mass from the fact that the Moon orbits the Earth in an average time of 27.3 days at an average distance of 384,000 km. (Hint: The Moon's mass is about 1/80 of Earth's.)

b. Find Jupiter's mass from the fact that its moon Io orbits every 42.5 hours at an average distance of 422,000 km.

c. You discover a planet orbiting a distant star that has about the same mass as the Sun, with an orbital period of 63 days. What is the planet's orbital distance?