Assignment #2

Kepler's Third Law

1. We find a new planet with two moons. The first moon is 3.56 E 6 m from the planet and goes around it every 29.3 hours. What is the k value of this planet?

Ans: **2.47 E -10 s^2/m^3**

2. The other moon is has period of 41.1 hours; what is its orbital radius?

Ans: **4.39 E 6 m**

3. Suppose we send a satellite into orbit around this planet with an orbital radius of 2.88 E 6 m. What would be the period of the satellite?

Ans: **76,800 sec = 21.3 hours**

4. Suppose that an astronomer reports a third moon to the planet at 5.02 E 6 m with a period of 46.9 hours. Is this possibly true?

Ans: **No, because the values of k are not the same.**

5. Compare two satellites revolving around Jupiter. One is synchronous with the rotation of Jupiter and goes around once each 9 hours 55 min. The other is the moon Ganymede with a period of 7.16 days and an orbital radius of 10.7 E 8 m. Set up a ratio and solve for the orbital radius of the synchronous satellite.

Ans: **1.60 E 8 m**

6. Compare two satellites revolving around the earth. One is the moon at a distance of 3.84 E 8 m and a period of 27.3 days. The other is a spy satellite at an altitude of 250 miles (400 km) above the surface of the earth. What is the orbital period of the spy satellite?

Ans: ra**dius of orbit = 6.78 E 6 m ; period = 5530 sec = 1.54 hours**

7. Compare two planets revolving around the same sun. If one planet has a period eight times the other, what must the ratio of distances be?

Ans: **4 to 1**

8. The data table shows the Galilean moons of Jupiter. There is a typographic error in the table. Where is it? Use Kepler's Law to determine which one.

	R (10^8 meters)	T (days)
Io	4.22	1.77
Europa	6.71	5.55
Ganymede	10.7	7.16
Callisto	18.8	16.7

Ans: **Europa**

9. We have been using seconds and meters to determine k. Can other units of length and time be used?

Ans: **yes**

Determine k of a planet if time is measured in years and distances in AU (See p. 9)

Ans: **1.000 yr^2/AU^3**

10. The major axis of the orbit of Halley's comet extends from a point very close to the sun to a point half way between the orbits of Neptune and Pluto. Use the table on page 9 of the text and determine the orbital period of the comet.

Ans: **R = 34.5 AU / 2 = 17.25 AU so T = 71 years.**