Kepler's Laws

Name: _____

1) In 1609, Galileo looked through his telescope at Jupiter and saw four moons. The name of one of those moons is Io. Restate Kepler's first and second law in terms of Jupiter and Io.

2) Earth moves more slowly in its orbit during summer in the northern hemisphere than it does during winter. Compare the distances of the Earth from the sun during the winter as compared to the summer.

3) Is the area swept out per unit time by Earth moving around the Sun equal to the area swept out per unit time by Mars moving around the Sun? Explain.

4) Galileo measured the orbital sizes of Jupiter's moons using the diameter of Jupiter as a reference. He found that Io, the closest moon to Jupiter, had a period of 1.8 days and was 4.2 units from the center of Jupiter.
a) Calisto, the fourth moon from Jupiter, has a period of 16.7 days. Using Galileo's units, predict Calisto's distance from Jupiter.

b) If Ganymede, one of Jupiter's moons, has a distance of 10.5 units, what is the period of Ganymede?

5) Using Table 8.1 on page 178, calculate the orbit time (period) for each of the other planets in our solar system based on Earth years. (Earth's period - 1 Earth year).

6) Our solar system contains an asteroid belt that is located between Mars and Jupiter. It takes one asteroid 6.13 Earth year to orbit the Sun. Find the asteroid's orbital radius as a multiple of Earth's orbital radius.

7) The Moon has a period of 27.3 days and a mean distance of 3.90×10^5 km from the center of the Earth.
a) Find the period of a satellite in orbit 6.70×10^3 km from the center of the Earth?

b) Predict the mean distance from the Earth's center for a satellite that has a period of 1.00 days.

Answers: 4a) 18.5 units   6) 5.02×10^{11} km   7a) 1.47 hrs