

Homework 15

Kepler's laws

1. A satellite is revolving around a spherical planet of mass M along a low-altitude orbit. The radius of the orbit R is close to the radius of the planet R_P : $R \approx R_P$. Prove that for a given average density of the planet ρ , the orbital period is independent on the size of the planet.
2. The rings of Saturn consist of myriad small particles, with each particle following its own circular orbit in Saturn's equatorial plane. The inner edge of the innermost ring is about 70,000 km from Saturn's center; the outer edge of the outermost ring is about 135,000 km from the center. Find the orbital period of the outermost particles as multiple of the orbital period of the innermost particles.

