16. –/3 points Notes Question: Giancoli6 5.P.086.

The comet Hale-Bopp has a period of 3000 years.

$$\frac{T_a^2}{r_a^3} = \frac{T_b^2}{r_b^3} = \frac{4\pi^2}{GM}$$

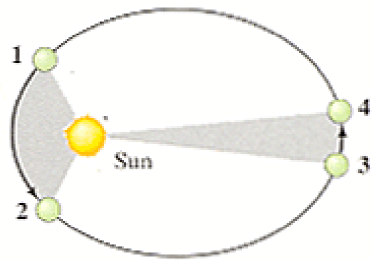


Figure 5-29

(a) What is its mean distance from the Sun? (1 A.U. = distance from Earth to the Sun)

AU

(b) At its closest approach, the comet is about 1 A.U. from the Sun. What is the farthest distance?

AU

(c) What is the ratio of the speed at the closest point to the speed at the farthest point? [Hint: Use Kepler's second law and estimate areas by a triangle (as in Figure 5-29, but smaller distance travelled; see also Hint for Problem 59.]

a) $$\frac{(1\,yr)^2}{(1\,AU)^3} = \frac{(3000\,yr)^2}{r^3}$$

b) $$r_{mean} = \frac{r_{max} + r_{min}}{2}$$

c)

$$F_c = F_G$$

$$\cancel{m_{HB}} \frac{v^2}{r} = G \frac{\cancel{m_{HB}} m_s}{r^2}$$

$$v^2 = G \frac{m_s}{r}$$

$$\frac{v_{max}}{v_{min}} = \frac{\sqrt{\cancel{G} \frac{\cancel{m_s}}{r_{min}}}}{\sqrt{\cancel{G} \frac{\cancel{m_s}}{r_{max}}}} = \sqrt{\frac{r_{max}}{r_{min}}}$$

8. –/2 points Notes Question: Giancoli6 5.P.049.

The rings of a Saturn-like planet are composed of chunks of ice that orbit the planet. The inner radius of the rings is 69,000 km, while the outer radius is 155,000 km. The mass of this planet is 4.25×10^{26} kg.

Find the period of an orbiting chunk of ice at the inner radius.

a) ______ hr

Find the period of an orbiting chunk of ice at the outer radius.

b) ______ hr

r should be in m

T should be in s

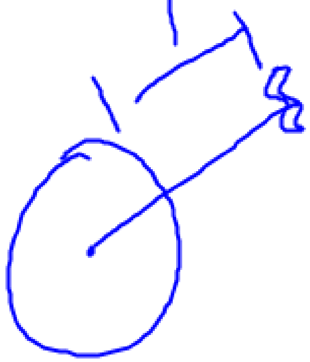
$$\frac{T_a^2}{r_a^3} = \frac{T_b^2}{r_b^3} = \frac{4\pi^2}{GM}$$

a) $$\frac{T_a^2}{(69\times10^6)^3} = \frac{4\pi^2}{\left(6.67\times10^{-11}\frac{Nm^2}{kg^2}\right)\left(4.25\times10^{24}\,kg\right)}$$

4. –/2 points Notes Question: HoltPhys06 7.P.027.

What would be the orbital speed and period of a satellite in orbit 1.49 × 10^8 m above the Earth?

orbital speed		m/s
period		s



$$F_c = F_G$$

$$\frac{\cancel{m_s}\, 4\pi^2 r}{T^2} = G\frac{\cancel{m_s}\, m_E}{r^2}$$

$$r = 1.49\times10^8 + r_E$$

$$v = \frac{2\pi r}{T}:$$