HW March 4, Johannes Byle

8.15

$$\tau^2 = 4\pi^2 \frac{a^3 \mu}{\gamma}$$

$$\tau^2 = 4\pi^2 \frac{a^3}{Gm_1 m_2} \frac{m_1 m_2}{m_1 + m_2} = \frac{4\pi^2 a^3}{G(m_1 + m_2)}$$

$$1 - \sqrt{\frac{1}{2 \times 10^{30} + 2 \times 10^{27}}} / \sqrt{\frac{1}{2 \times 10^{30}}} \approx 0.049\%$$

8.18

$$r(\phi) = \frac{c}{1 + \epsilon \cos(\phi - \delta)}$$

$$c = \frac{l^2}{Gm_1 m_2} \frac{m_1 + m_1}{m_1 m_2} \approx \frac{l^2}{Gm_2} \approx \frac{(r_{min} v_{max})^2}{gR_e^2}$$

$$-\frac{c}{r_{min}} + 1 = \epsilon \approx \frac{r_{min} v_{max}^2}{gR_e^2} - 1 \approx 0.045$$

At apogee:

$$r = \frac{c}{1 + \epsilon} \approx 10765m$$