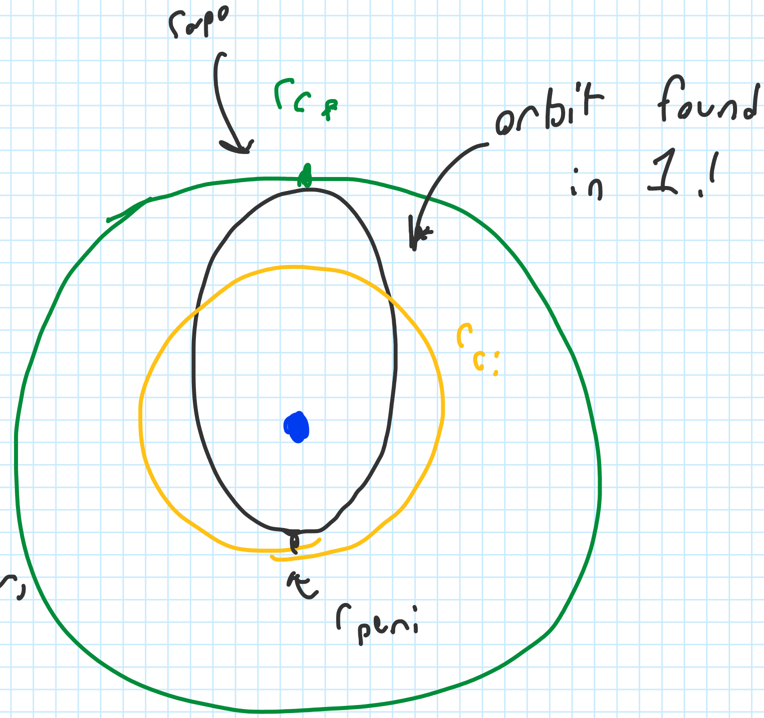
HW6 Astrodynamics | Romeo Perlstein section 0101

Tuesday, April 23, 2024 6:38 AM

Q3 :



Case 1:

$\vec{r}_1 = [8000, 0, 0]$
$\vec{r}_2 = [7000, 7000, 0]$

Utilizing TOF, r_1, r_2 to find orbit (Lamberts prob)

from MATLAB code, lambert solver, and cart2orbelements() function:

$$\left.\begin{array}{l} \underline{e = .848612} \\ \underline{a = 8949.7 \text{ km}} \end{array}\right\} \text{checks out for initial \& final!}$$

$r_{c_i} = r_{peri}$

$r_{c_f} = r_{Apo}$

$$r_p = a(1-e), \quad r_a = a(1+e) \left\} \begin{array}{l} r_p = 1043.4122 \text{ km} \\ r_a = 12741.1777 \text{ km} \end{array}\right.$$

$$V_{tf_{peri}} = \sqrt{\frac{2\mu_E}{r_p} - \frac{2\mu_E}{r_p + r_a}}$$

$$= \frac{2(398600)}{(1043.41)} - \frac{2(398600)}{(1043.41 + 12741)}$$

$$V_{tf_{peri}} = 26.5744 \text{ km/s}$$

$$V_{tf_{Apo}} = \sqrt{\frac{2\mu_E}{r_a} - \frac{2\mu_E}{r_p + r_a}}$$

$$= \frac{2(398600)}{(12741)} - \frac{2(398600)}{(1043.41 + 12741)}$$

$$= 2.1763 \text{ km/s}$$

$$V_{circ_i} = \sqrt{\frac{\mu_E}{r_{c_i}}} = \sqrt{\frac{\mu_E}{r_p}} = \sqrt{\frac{398600}{1043}} = \underline{19.5452 \text{ km/s}}$$

$$V_{circ_f} = \sqrt{\frac{\mu_E}{r_{c_f}}} = \sqrt{\frac{\mu_E}{r_a}} = \sqrt{\frac{398600}{12741}} = \underline{5.5932 \text{ km/s}}$$

$$\Delta V_1 = V_{tf_{peri}} - V_{circ_i} = 7.0292 \text{ km/s}$$

$$\Delta V_2 = V_{circ_f} - V_{tf_{apo}} = 3.4170 \text{ km/s}$$

$$\Delta V = \Delta V_1 + \Delta V_2 = \underline{10.4462 \text{ km/s}}$$