Exam2 review

Exam Topics:

Everything from Exam 1
All material thru Lambert Solver

Kepler's TOF
Groundtracks
Maneuvers:
- Tangential
- Non-tangential
  - in plane
  - out of plane

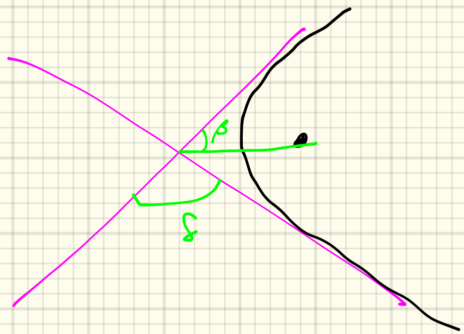
Patched Conics

Flybys

Kepler's Pred Prob

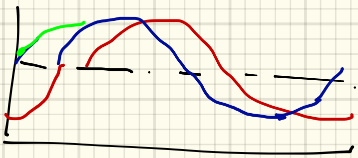
Lambert's Prob

Coordinate Systems: ECI, PQW, SEZ, Heliocentric Inertial

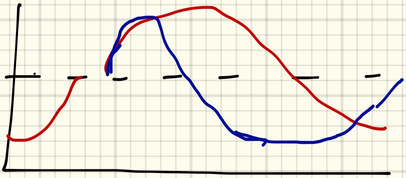


Ground tracks:

a) Changes period of orbit => changes the offset between 2 consecutive passes



e| B/c the s/c speed is changing, the slope of the groundtrack can change



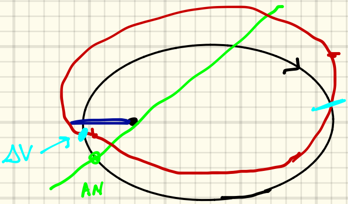
i| max/min latitude reached by s/c

Ω| longitude of ascending node

ω| if $a_1 = a_2$ & $e_1 = e_2$ & $\omega_1 \neq \omega_2$ ⇒ Change in location (longitude) of the descending node

HW 4, prob 3:

Change argument of periapsis from 45° to 30°



$r_1 = r_2$ @ r_b $\quad a_1 = a_2,\ e_1 = e_2 \quad \frac{P_1}{1+e_1\cos\nu_1} = \frac{P_2}{1+e_2\cos\nu_2} \quad P_1 = P_2$

$\Rightarrow \cos\nu_1 = \cos\nu_2$ Note: $\cos(\theta) = \cos(-\theta)$

$\nu_1 = -\nu_2$

$$\omega_1 + \nu_1 = \omega_2 + \nu_2$$

$$45 - \nu_2 = 30 + \nu_2$$

$$15 = 2\nu_2 \Rightarrow \boxed{\nu_2 = 7.5°}$$

$$r_b = \frac{P_2}{1+e_2\cos\nu_2}$$

$\mathcal{E} = \frac{v_2^2}{2} - \frac{\mu}{r_b} = -\frac{\mu}{2a_2} \quad V_1 = V_2,\ \gamma_1 = -\gamma_2$

$\Delta V^2 = V_1^2 + V_2^2 - 2V_1V_2\cos\theta$, $\quad \Delta V^2 = 2V^2(1 - \cos(2\gamma))$

HW 4, #4:

$r_c = 60{,}000\text{ km}$, $i_1 = 10°$

a) $i_2 = 15°$

$$\Delta v^2 = v_1^2 + v_2^2 - 2v_1v_2\cos\theta$$

$$v_1 = v_2$$

$$\Delta v^2 = 2v^2(1-\cos\theta) \qquad \theta = \Delta i$$

$$\Delta v^2 = 2v^2(1-\cos(5))$$

b) only @ ascending node or descending node

c) $r_{p2} = 59{,}000\text{ km}$ Changing e & i.

$r_{a2} = 60{,}000\text{ km}$

$\omega_2 = 0 \Leftarrow$ required to be 0 or 180 for the 2 orbits to intersect.

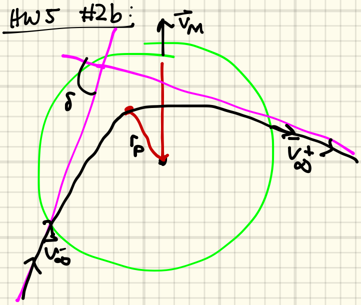
Orbits intersect @ r_{a2} $\Rightarrow$ so burn occurs here.

$$\left.\begin{array}{l}\gamma_2 = 0 \text{ (b/c apoapsis)}\\ \gamma_c = 0 \text{ (circle)}\end{array}\right] \rightarrow \theta = \Delta i$$

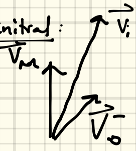
$$v_1 \neq v_2$$

$$\Delta v^2 = v_c^2 + v_2^2 - 2v_cv_2\cos(\Delta i)$$

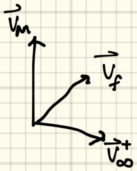
HW5 #2b:



Initial:



Final:



$$\Delta v^2 = 2v_\infty^2(1-\cos\delta)$$

$$|\vec{v}_f| < |\vec{v}_i|$$