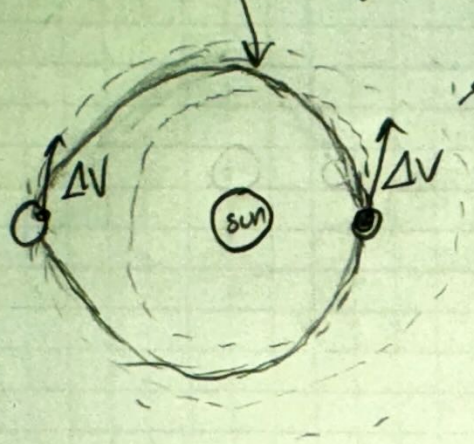
2)

a) Transfer

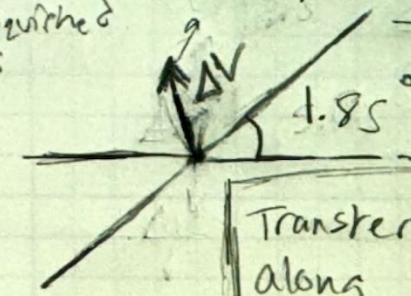


Top View

Mars orbit a little squished from this POV

Side View

(maintain speed of earth/Mars → just changing direction)



→ Mars Sun plane
→ Curtis Appendix A
→ Earth Sun plane

Transfer along Mars Sun plane to Mars along Earth Sun plane to Earth

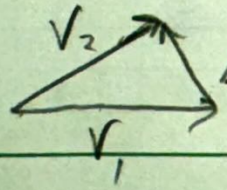
ΔV can only happen at the points the xfer orbit intersects the plane it wants to xfer onto. which for a Mission to mars is only at each planet. (Ascending / descending node)

c) having to change inclination does not significantly impact the timing of departure because when we depart we enter the mars-sun plane while maintaing the speed of earth for this case because that allows us to do the hohmann transfer at any time. Now that we are in the mars-sun plane The same idea is true for return to Earth. The only critical timing step is that the change of inclination must happen on the node line created by the mars-sun and earth-sun plane

d)

$V_1 = V_2$

$\Delta V_i = 2V\sin\left(\frac{\Delta i}{2}\right)$



This is done assuming the satellite is moving the speed of earth when it burns (maintains earths speed for later hohmann) in the heliocentric frame

Leaving earth: $|\Delta V_i| = 2\cdot(29.789\ \frac{km}{s})\sin\left(\frac{1.85^\circ}{2}\right)$

$= \boxed{0.962\ \frac{km}{s}}$

Leaving mars: $|\Delta V_i| = 2(24.135\ \frac{km}{s})\sin\left(\frac{1.85^\circ}{2}\right)$

$= \boxed{0.779\ \frac{km}{s}}$