

# MAE3145: Homework 6 Selected Answers

Due date: 2 456 069.417 JD

## Problem 1

- Total  $\Delta V = 15.707 \text{ km s}^{-1}$
- Total time of flight  $TOF = 30.63 \text{ years}$
- Actual Voyager 2 TOF  $TOF = 12.02 \text{ years}$

## Problem 2

- Plane change at current altitude  $\Delta V = 2.31006 \text{ km s}^{-1}$
- Plane change using bielliptical transfer  $\Delta V = 1.457 \text{ km s}^{-1}$

## Problem 3

- $\Delta V$  is all three reference frames for maneuver at  $\nu = 90^\circ$

```
DV : 0.3750000000000001 V -0.649519052838329 C 0.0 N km/sec
DV : -0.46379179721347064 R 0.5894040794204761 T 0.0 H km/sec
DV : -0.5894040794204761 P -0.4637917972134706 Q 0.0 W km/sec
```

- New orbit velocity -  $V_2 = 4.21790 \text{ km s}^{-1}$
- New orbit true anomaly -  $\nu = 40.8^\circ$
- $\Delta V$  is all three reference frames for maneuver at  $E = 270^\circ$

```
DV : 0.3750000000000001 V -0.649519052838329 C 0.0 N km/sec
DV : -0.7452940449895329 R 0.08388555598635647 T 0.0 H km/sec
DV : 0.37500000000000067 P 0.6495190528383287 Q 0.0 W km/sec
```

- New orbit velocity -  $V_2 = 3.6 \text{ km s}^{-1}$
- New orbit true anomaly -  $\nu = 259.36^\circ$

## Problem 4

- Phasing orbit period 11 131.7 s
- Total  $\Delta V = 4.2657 \text{ km s}^{-1}$

## Problem 5 to 8

- You can compare all of the answers with `comfix_solution.txt` within the MAE3145\_Library

## Problem 9

- A to C total  $\Delta V = 2.078 \text{ km s}^{-1}$
- B to D total  $\Delta V = 1.605 \text{ km s}^{-1}$

## Problem 10

- Total  $\Delta V = 3.761 \text{ km s}^{-1}$  and  $\Delta V = 3.785 \text{ km s}^{-1}$
- TOF  $TOF = 199 \text{ h}$  and  $TOF = 22.38 \text{ h}$

## Problem 11

- $\Delta V_1 = 3.212 \text{ km s}^{-1}$
- $\Delta V_2 = 2.336 \text{ km s}^{-1}$

## Problem 12

Extra credit