Lab 3: Introduction to Pork Chop Plots

ANSWER SHEET

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1. Analyzing the 2005 Earth to Mars opportunity.

   a) Departure: Between 70 and 80 days after Jun 4 (3 pts)

      Arrival: Between 200 and 240 days after Dec 1 (3 pts)

      Is this a Type I or a Type II trajectory? Type II (3 pts)

   b) Departure: 65 days after Jun 4 (3 pts)

      Arrival: 80 days after Dec 5 (3 pts)

      Why? (3 pts)
      This transfer has a minimal C3 value (~16 km^2/s^2) and is also a significantly shorter time of flight than a comparable (in C3) type II transfer.

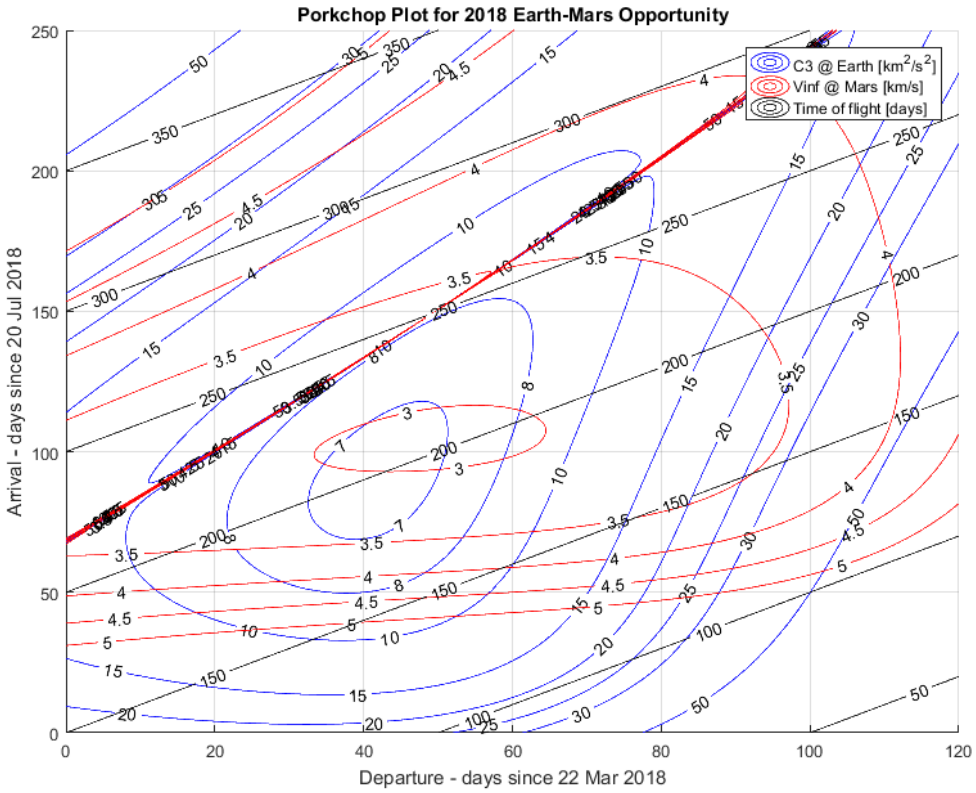
      Is this a Type I or a Type II trajectory? Type I (3 pts)

   c) Departure: ~85 days after Jun 4(3 pts)

      Arrival: ~60 days after Dec 1 (3 pts)

      Is this a Type I or a Type II trajectory? Type I(3 pts)

2. Generate a pork chop plot for the 2018 Earth to Mars opportunity. (30 pts)



a) Departure Type I: 40-50 days (3pts)

Arrival Type I: 90-110 days (3pts)

Departure Type II: 40-60 days (3pts)

Arrival Type II: 150-160 days (3pts)

b) Which is better? Type I, shorter travel time and lower C3. (3pts)

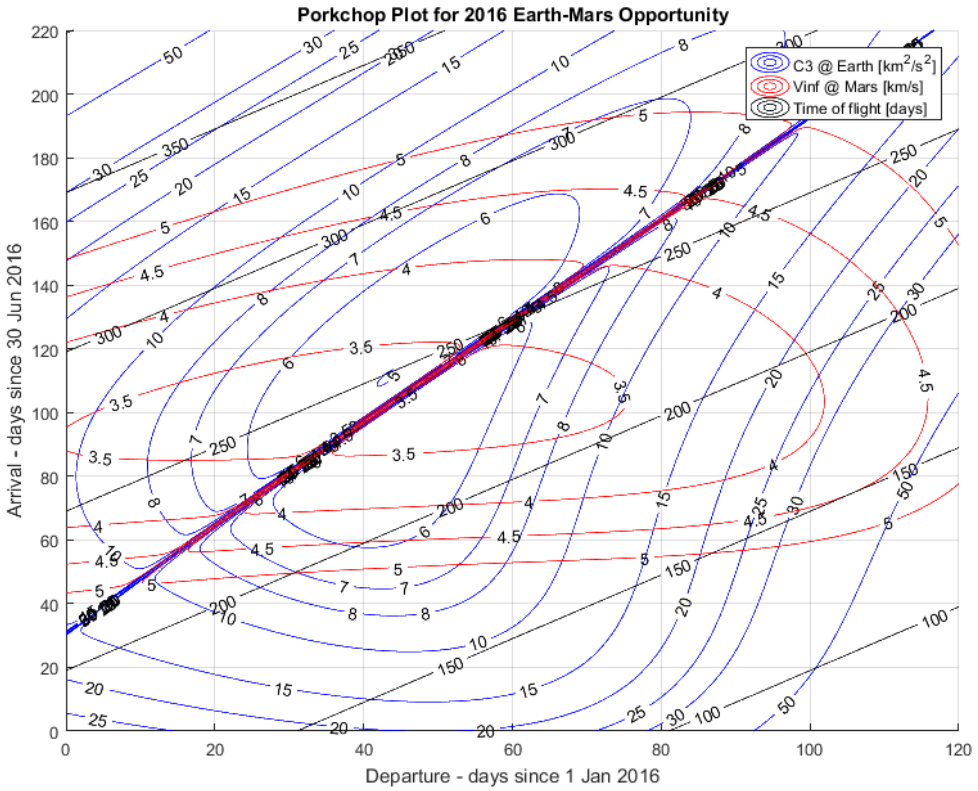
c) Departure: 50-60 days (3pts)

Arrival: 90-110 days (3pts)

Is this a Type I or a Type II trajectory? Type I (3pts)

Is this a reasonable trajectory? Why/Why not? (3pts)
Yes, the C3 is realistic, however the launch window is fairly small and there isn't a lot of margin on the 200 day transfer time.

3. Generate a pork chop plot for the 2016 Earth to Mars opportunity. (30 pts)



a) Departure Type I: 30-60 days(3pts)

Arrival Type I: 60-120 days (3pts)

Departure Type II: 25-50 days (3pts)

Arrival Type II: 80-120 days (3pts)

b) Which is better? Type I, shorter time of flight, other parameters comparable. (3pts)

c) Departure: 50-60 days(3pts)

Arrival: 55-70 days (3pts)

Is this a Type I or a Type II trajectory? Type I (3pts)

Is this a reasonable trajectory? Why/Why not? (3pts)
Yes: the C3 is achievable and the excess velocity at Mars is less than the maximum allowed.