Lab 5: New Horizon's Mission Design
Due: Mar. 3

ANSWER SHEET

Name:_____John Clouse_____ _____/132

NOTE: PLEASE give all answers in Julian Dates or Calendar Dates (i.e. Jan 1, 2010)

Part I.

Problem 1.

C3: 165.5 km^2/s^2_____(3 pts)

RLA: -146.85 deg_____(3 pts)

DLA: 3.03 deg_____(3 pts)

$|V_\infty^{in,JGA}|$: 19.09 km/s_____(3 pts)

Problem 2.

$|V_\infty^{out,JGA}|$: 18.61 km/s_____(3 pts)

$|V_\infty^{in,P}|$: 14.14 km/s_____(3 pts)

Problem 3.

Why should the values of $|\mathbf{V}_\infty^{in,JGA}|$ and $|\mathbf{V}_\infty^{out,JGA}|$ be identical? (5 pts)
They should be the same because no propulsive maneuvering is performed, thus energy should be the same, and the velocities at SOI should be the same. I'm about 0.5 km/s off.

How close are they using these dates and your code? 0.5 km/s_____ (1 pt)

What might have caused the observed differences? (5 pts)
I believe assumption about Jupiter not moving may be playing a role, as well as 3rd-body effects of Jupiter on the heliocentric spacecraft, and possibly some error in the ephemeris calculation.

Problem 4.

B_T: 2.478446e+06 km_____(3 pts)

B_R: 2.531541e+05 km_____(3 pts)

Turn Angle: 15.9 deg_____(3 pts)

h_p: 2.09599e+06 km_____(3 pts)

Problem 5.

ΔV: 5.28 km/s_____(3 pts)

Pork Chop Plots:

Launch – JGA: (20 pts)

(Please attach to this Answer Sheet)

JGA – Pluto/Charon: (20 pts)

(Please attach)

Candidate Gravity Swingbys:

6a: C3: 153 km^2/s^2_____(3 pts)

6b: Pluto/Charon Arrival Date: May 6, 2015_____(3 pts)
(Please write this date as a JD or as a standard, readable date, i.e., Jan. 9th, 2006)

6c: $|\mathbf{V}_\infty^{in,P}|$: 12.74 km/s_____(3 pts)

6d: (10 pts)

C3: 162 km^2/s^2_____

JGA Date: March 8, 2007_____

$\mathbf{V}_\infty^{out}$| and |$\mathbf{V}_\infty^{in}$|: 17.9036 and 17.9040_____

Pluto/Charon Arrival Date: April 22, 2016_____

|$\mathbf{V}_\infty^{in,P}$|: 12.82 km/s_____

How does this compare with New Horizons'? Is it better? What do you think? (10 pts)
I think it's a little better in terms of passing by the target more slowly, so more science can be done. However, this sacrificed speed might make it less capable of passing Kuiper Belt Objects of interest.

Impact Considerations:

7a: C3: 153 km^2/s^2_____(3 pts)

7b: Pluto/Charon Arrival Date: May 6, 2015_____(3 pts)
(Please write this date as a JD or as a standard, readable date, i.e., Jan. 9th, 2006)

7c: |$\mathbf{V}_\infty^{in,P}$|: 12.74 km/s_____(3 pts)

7d: (10 pts)

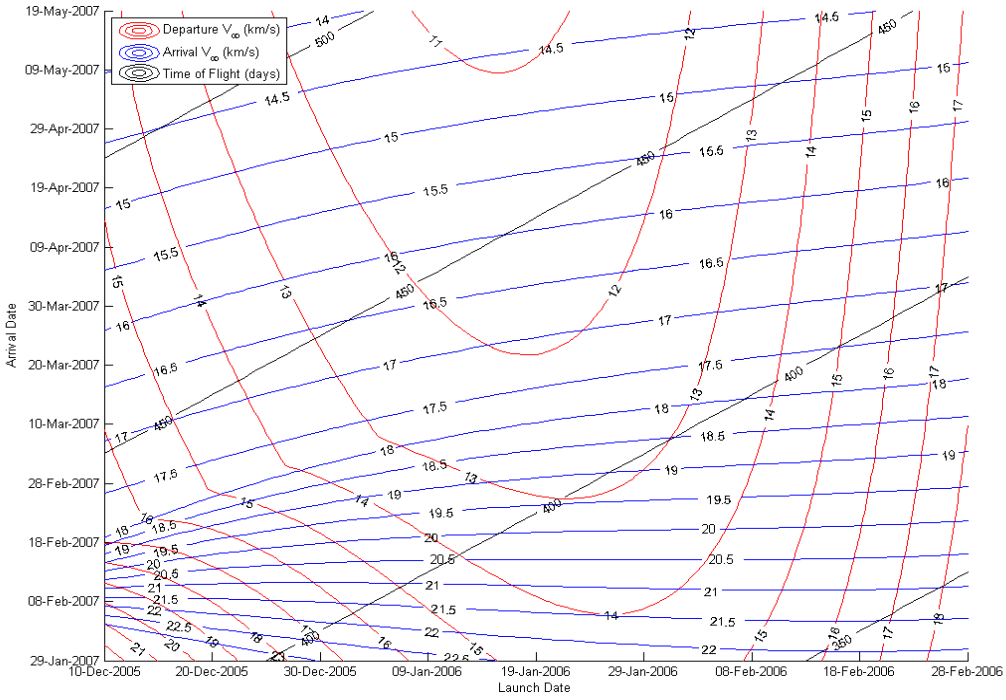
C3: 162 km^2/s^2_____

JGA Date: March 8, 2007_____

Pluto/Charon Arrival Date: April 22, 2016_____

|$\mathbf{V}_\infty^{in,P}$|: 12.82 km/s_____

Extra Credit_____(10 pts)


Departure V_∞ (km/s)
Arrival V_∞ (km/s)
Time of Flight (days)
Arrival Date
Launch Date
19-May-2007
09-May-2007
29-Apr-2007
19-Apr-2007
09-Apr-2007
30-Mar-2007
20-Mar-2007
10-Mar-2007
28-Feb-2007
18-Feb-2007
08-Feb-2007
29-Jan-2007
10-Dec-2005
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09-Jan-2006
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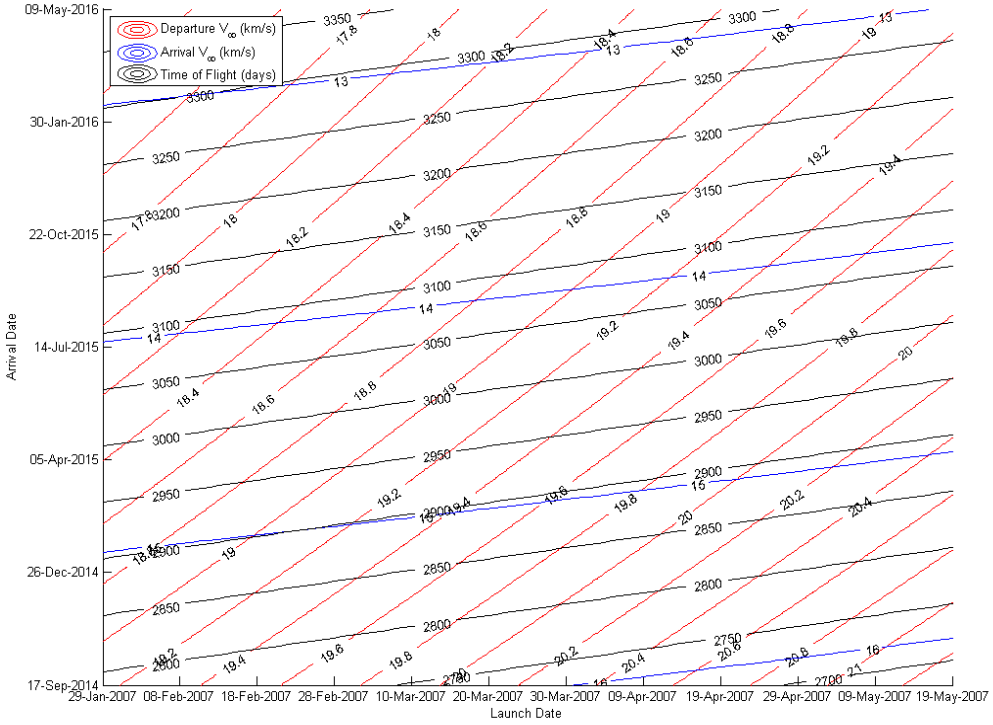
18-Feb-2006
28-Feb-2006


Departure V_∞ (km/s)
Arrival V_∞ (km/s)
Time of Flight (days)
Arrival Date
Launch Date
09-May-2016
30-Jan-2016
22-Oct-2015
14-Jul-2015
05-Apr-2015
26-Dec-2014
17-Sep-2014
29-Jan-2007
08-Feb-2007
18-Feb-2007
28-Feb-2007
10-Mar-2007
20-Mar-2007
30-Mar-2007
09-Apr-2007
19-Apr-2007
29-Apr-2007
09-May-2007
19-May-2007