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## Roshan Jaiswal-Ferri

```
%Section - 01
%Aero 351 Final Exam Question 2: 12/07/24
```

## Workspace Prep

```
format long          %Allows for more accurate decimals
close all;           %Clears all
clear all;           %Clears Workspace
clc;                 %Clears Command Window
```

## Constant/Global Vars

```
options = odeset('RelTol',1e-8,'AbsTol',1e-8);
muSun = 1.327e11; %mu values from curtis
muMars = 42828;
mu = 398600; %earth
muJup = 126686534;
Rmars = 3396; %km
Rearth = 6378; %km
Rjup = 71490;
tol = 1e-8;
ap = 149598000; %1 AU in km
P = (0.75*365.25)*86400; %period in seconds
Re = 149598000;
flyr = Rearth + 10000; %km
```

## Finding COEs of Elliptical Orbit

```
a = ((muSun*P^2)/(4*pi^2))^(1/3);
ecc = (ap-a)/a;
theta = 180; %at apogee true anomaly is 180 deg
h = sqrt(ap*muSun*(1+ecc*cosd(theta)));
```

## Calculating Fly By Characteristics

```
Vsc1 = h/ap;
Ve = sqrt(muSun/Re);
```

---

```
Vinf = Ve - Vsc1;  
phi = 180; %ht ellipse where planet V is faster therefor phi = 180  
ecch = 1 + (flyr*(Vinf^2))/muSun; %1.0000013 is hyperbolic
```

## Finding Turn Angle & \phi\_2

```
ta = 2*asind(1/ecch); %turn angle  
phi2 = phi - ta;
```

## Finding V S/C 2

```
Vinf2 = [Vinf*cosd(phi2), Vinf*sind(phi)];  
Vsc2 = Vinf2 + [Ve,0];  
Vsc1 = [Vsc1, 0];  
  
dV = norm(Vsc1 - Vsc2); %<3: This is under the earth max so its ok  
disp(['Gained Delta V (km/s): ', num2str(dV)])  
  
Gained Delta V (km/s): 6.6718
```

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