
ASEN 3200 HW O-5 Problem 5 Script

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Housekeeping

```
clc; clear; close all
```

Constants and givens

```
mu = 398600; % km^3/s^2, Earth
rA = 300 + 6378; % km
T = 2*pi*sqrt(rA^3/mu); % sec
```

```
n = (2*pi)/T; % rad/s
```

```
r0 = [50; 0; 0]; % m
v0 = [0; -100*n; 0]; % m/s
```

```
size = 35; % Marker size for 3D plot
```

Relative Motion matrices

```
Phi_rr = @(t,n) [
    4 - 3*cos(n*t),      0,      0;
    6*(sin(n*t) - n*t),  1,      0;
    0,                   0,      cos(n*t)
];
```

```
Phi_rv = @(t,n) [
    (1/n)*sin(n*t),      (2/n)*(1-cos(n*t)),  0;
    (2/n)*(cos(n*t) - 1), (4/n)*sin(n*t) - 3*t,  0;
    0,                   0,      (1/
n)*sin(n*t)
];
```

```
Phi_vr = @(t,n) [
    3*n*sin(n*t),      0,      0;
    6*(n*cos(n*t)-n),  0,      0;
    0,                 0,      -n*sin(n*t)
];
```

```
Phi_vv = @(t,n) [
    cos(n*t),      2*sin(n*t),      0;
    -2*sin(n*t),   4*cos(n*t) - 3,   0;
    0,             0,               cos(n*t)
];
```

Problem

```
v0plus = (Phi_rv(T/4,n)^-1)*([0; -200; 0] - Phi_rr(T/4, n)*[50; 0; 0]); % m/s
deltaV1Vec = v0plus - v0
deltaV1 = norm(deltaV1Vec) % m/s
```

```
vlminus = Phi_vr(T/4,n)*r0 + Phi_vv(T/4,n)*v0plus
deltaV2Vec = [0; 0; 0] - vlminus
deltaV2 = norm(deltaV2Vec)
```

```
deltaV1Vec =
```

```
    0.0704
   -0.0352
         0
```

```
deltaV1 =
```

```
    0.0787
```

```
vlminus =
```

```
   -0.1282
   -0.0352
         0
```

```
deltaV2Vec =
```

```
    0.1282
    0.0352
         0
```

```
deltaV2 =
```

```
    0.1330
```

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