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Initialize

```
clear; clc;
```

Problem 5.4

Define variables and constants

```
global mu
mu = 398600;        % km^3/s^2

% Initial conditions
r1 = [3600 4600 3600];          % km
r2 = [-5500 6240 -5200];        % km
dt = 30*60;                     % s
string = "pro";

% use lambert function (alogrithm 5.2) from book to get v at each position
[v1, v2] = lambert(r1, r2, dt, string);
```

calculate epsilon

get mangitude of v and r

```
v = norm(v1);
r = norm(r1);

% calculate and return epsilon
e = v^2/2 - mu/r;
fprintf("epsilon=%g km^2/s^2", e)
```

```
epsilon=-19.8706 km^2/s^2
```

Problem 5.5

calculate h

```
h1 = cross(r1, v1);
h = norm(h1);

% calc e
e = sqrt(1 + h^2/mu^2*(v^2 - 2*mu/r));
```

```
% then get r, z, and i
r = h^2/mu*1/(1 + e);
zp = r - 6378;
i = acosd(h1(3)/h);

% print results
fprintf("\nz perigee=%g km", zp);
fprintf("\ni=%g deg", i);
```

```
z perigee=473.589 km
i=44.168 deg
```

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