```
clear

% initialize constants
G=6.7e-11;
mSun = 1.9e30;
rEarthOrbit = 150e9;
rSun=695500000;
mEarth = 5.9742e24;
rEarth = 6.378e6;


% initialize data storage arrays
M=10;
I=1000;
Ii=1;

XE=zeros(I,1); YE=zeros(I,1);
XP=zeros(I,1); YP=zeros(I,1);
T=zeros(I,1);


t=0; T(1)=0;

% set launch parameters for a earth orbit, earth is on the horizontal axis
xE=rEarthOrbit; XE(1)=xE;             % starting earth x coordinate
vxE=0;                                % starting earth x velocity
yE=0;  yE(1)=yE;                      % starting earth y coordinate
vyE=28500;                            % starting earth y velocity

% set launch parameters for probe from the space station
xP=rEarthOrbit + rEarth + 402000;  XP(1)=xP;    % starting probe x coordinate
vxP=0;                                          % starting probe x velocity
yP=0;  yP(1)=yP;                      % starting probe y coordinate
vyP=28500 + 7706;       % probe velocity = earth's velocity + space station velocity

dt=2;

N1 = 3*92*60 / dt;   % the space station orbit is 92 min, run for 3 orbits

for i=1:N1

   % project the earth's orbit

   t = t+ dt;

   % project earth orbit

   % resolve the earth sun gravity vector
   rSE = sqrt(xE^2 + yE^2); % compute rE
   gSE = -G*mSun/rSE^2;             % compute gravity magnitude
   cosSE = xE/rSE;             % compute cos theta
   sinSE = yE/rSE;             % compute sin theta

   xE=xE+vxE*dt;        % project earth position
   yE=yE+vyE*dt;

   vxE= vxE+ gSE*cosSE*dt;   % project earth velocity
   vyE = vyE+ gSE*sinSE*dt;

   % project probe orbit

   % resolve the sun - probe gravity vector
   rSP = sqrt(xP^2 + yP^2); % compute sun - probe distance
```

```
    gSP = -G*mSun/rSP^2;        % compute gravity magnitude
    cosSP = xP/rSP;             % compute cos theta
    sinSP = yP/rSP;             % compute sin theta

    % resolve the earth - probe gravity vector
    xEP = xP - xE;
    yEP = yP - yE;

    rEP = sqrt(xEP^2 + yEP^2); % compute earth - probe distance
    gEP = -G*mEarth/rEP^2;       % compute gravity magnitude
    cosEP = xEP/rEP;             % compute cos theta
    sinEP = yEP/rEP;             % compute sin theta

    ax = (gSP*cosSP + gEP*cosEP);   % compute probe x and y accel
    ay = (gSP*sinSP + gEP*sinEP);

    xP=xP+vxP*dt;        % project probe position
    yP=yP+vyP*dt;

    vxP = vxP+ ax*dt;  % project probe velocity
    vyP = vyP+ ay*dt;

    % record data for graphs
    if mod(i,M)== 0
       Ii=Ii+1;
       T(Ii)=t;
       XP(Ii)= xP;
       YP(Ii)= yP;
       XE(Ii)= xE;
       YE(Ii)= yE;
       end

end


II=1:Ii;

plot(XP(II),YP(II))   % plot probe trajectory
hold on
plot(XE(II),YE(II))   % plot earth trajectory

hold off
```