

## Ch\_6\_Lesson\_7\_Ex\_1

```
clear

G=6.7e-11;           % gravitational constant
mEarth = 5.9742e24; % mass of the earth
rEarth = 6.378e6;    % radius of the earth

dt = 60;             % length of each subinterval
n = 28.5*24*60;      % number of subintervals, 27.5 days

% paramters for orbit 38500 km above earth
% start time
x(1) = 0;            % initial x position
y(1) = rEarth + 38500000; % initial y position
vx(1) = 1023;        % initial x velocity
vy(1) = 0;           % initial x velocity

for i=2:n+1
    x(i) = x(i-1) + vx(i-1)*dt; % x at start of interval i
    y(i) = y(i-1) + vy(i-1)*dt; % y at start of interval i

    R = sqrt(x(i-1)^2+y(i-1)^2); % R at start of interval i-1
    Ag = G*mEarth/R^2;           % gravity at start of interval i-1

    vx(i)= vx(i-1) - Ag*(x(i-1))/R*dt; % x velocity at start of interval i
    vy(i)= vy(i-1) - Ag*(y(i-1))/R*dt; % y velocity at start of interval i
end

plot(x,y)
```