

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

```
clear

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

dt = 1;              % length of each subinterval
n = 12*60*60 + 58+60; % number of subintervals, 12 hours and 58 minutes

% paramters for orbit 202000 km above earth
t(1) = 0;            % start time
x(1) = 0;            % initial x position
y(1) = rEarth + 2020000; % initial y position at alt. 300km
vx(1) = 3900;        % initial x velocity
vy(1) = 0;          % initial x velocity

for i=2:n+1
    t(i) = t(i-1) + dt; % time at start of interval i
    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)
axis equal
```