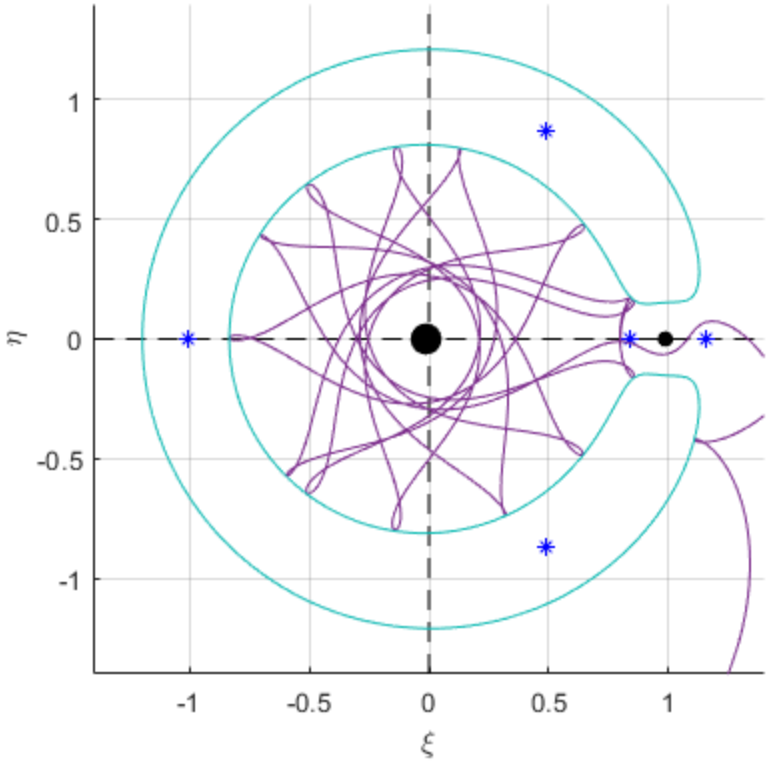
```
function ThreeBodyProblem

m1 = 5.9722*10^24; %Earth Mass(kg)
m2 = 7.34767*10^22; %Moon Mass(kg)

mu = (m1/m2+1)^(-1); %Jacobi Mu Non-Dimensional Constant
```

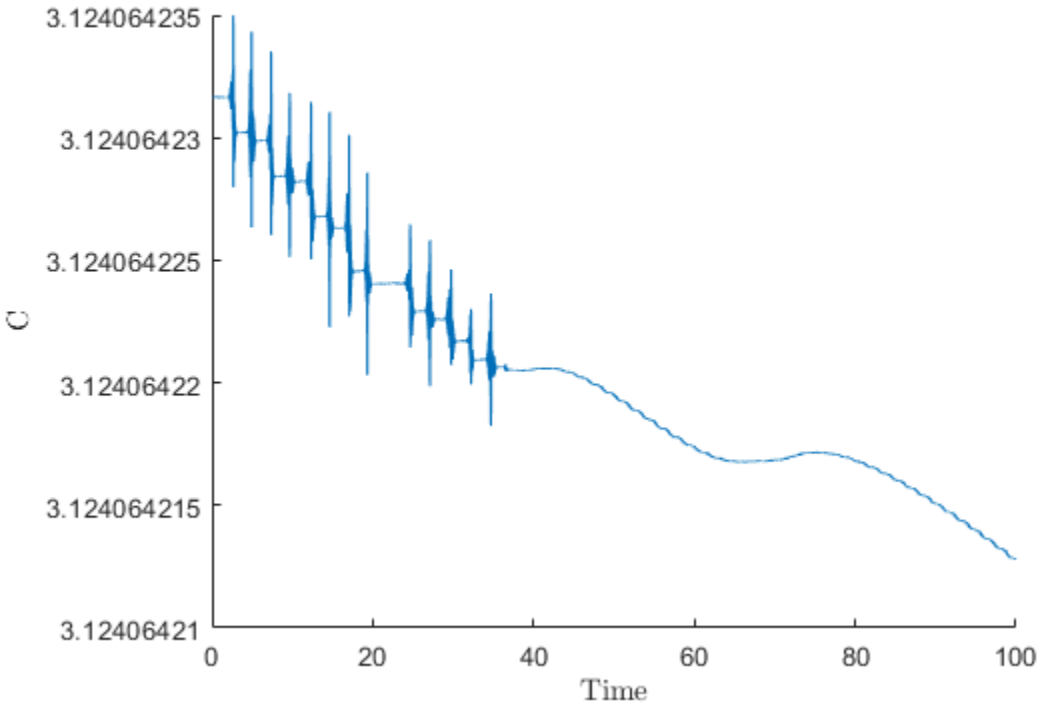
Jacobi Synodic Frame Plot:

```
xi0 = [.8;0]; eta0 = [0;.3];
x0 = [xi0;eta0];
tspan = [0 100];

[t,x] =
 ode45(@(t,x)JacobiEOM(t,x,mu),tspan,x0,odeset('AbsTol',1e-12,'RelTol',1e-9));


r1 = sqrt((x(:,1)+mu).^2+x(:,3).^2);
r2 = sqrt((x(:,1)-1+mu).^2+x(:,3).^2);
C = 2*((1-mu)*(.5*r1.^2+r1.^(-1))+mu*(.5*r2.^2+r2.^(-1)))-
(x(:,2).^2+x(:,4).^2);
%U = (1-mu)./r1 + mu./r2;

[X,Y,CC] = ZeroVelCurve(mu,[-1.4 1.4],[-1.4 1.4]);

figure; hold on; axis equal; grid on; axis([-1.4 1.4 -1.4 1.4]);
xlabel('\xi'); ylabel('\eta'); title('Circular-Planar Synodic Frame
 Three-Body Problem','interpreter','latex','fontsize',20);
plot([-1.4 1.4],[0 0],'--k');
plot([0 0],[-1.4 1.4],'--k');
plot(-mu,0,'k.','MarkerSize',40);
plot(1-mu,0,'k.','MarkerSize',20);
plot(0,0,'k.');

l = plot(.83692,0,'b*');
plot(1.15568,0,'b*');
plot(-1.00506,0,'b*');
plot(.48785,.86603,'b*');
plot(.48785,-.86603,'b*');

plot(x(:,1),x(:,3));

contour(X,Y,CC,[C(1) C(1)]);

figure; hold on;
xlabel('Time','interpreter','latex');
 ylabel('C','interpreter','latex');title('Jacobi
 Integral','interpreter','latex','fontsize',35);
plot(t,C);
```

ircular-Planar Synodic Frame Three-Body Prob



Jacobi Integral



```
end

function xdot = NewtonEOM(x,m)

G = 6.6743*10^(-17); %Nkm^2/kg^2

xdot = [x(4:6)
        G*m2*(x(7:9)-x(1:3))/(sqrt(sum((x(7:9)-
x(1:3)).^2)))^3+G*m3*(x(13:15)-x(1:3))/(sqrt(sum((x(13:15)-
x(1:3)).^2)))^3
        x(10:12)
        G*m1*(x(1:3)-x(7:9))/(sqrt(sum((x(7:9)-
x(1:3)).^2)))^3+G*m3*(x(13:15)-x(7:9))/(sqrt(sum((x(13:15)-
x(7:9)).^2)))^3
        x(16:18)
        G*m1*(x(1:3)-x(13:15))/(sqrt(sum((x(13:15)-
x(1:3)).^2)))^3+G*m2*(x(7:9)-x(13:15))/(sqrt(sum((x(13:15)-
x(7:9)).^2)))^3];

end

function xdot = JacobiEOM(t,x,mu)

xdot = [x(2)
        -(1-mu)*(x(1)+mu)/((x(1)+mu)^2+x(3)^2)^(3/2)-mu*(x(1)+mu-1)/
((x(1)+mu-1)^2+x(3)^2)^(3/2)+2*x(4)+x(1)
        x(4)
        -((1-mu)/((x(1)+mu)^2+x(3)^2)^(3/2)+mu/
((x(1)+mu-1)^2+x(3)^2)^(3/2))*x(3)-2*x(2)+x(3)];

end

function [X,Y,C] = ZeroVelCurve(mu,xlim,ylim)

[X,Y] =
 meshgrid(linspace(xlim(1),xlim(2),1000),linspace(ylim(1),ylim(2),1000));

r1 = sqrt((X+mu).^2+Y.^2);
r2 = sqrt((X-1+mu).^2+Y.^2);
C = 2*((1-mu)*(.5*r1.^2+r1.^(-1))+mu*(.5*r2.^2+r2.^(-1)));

end
```

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