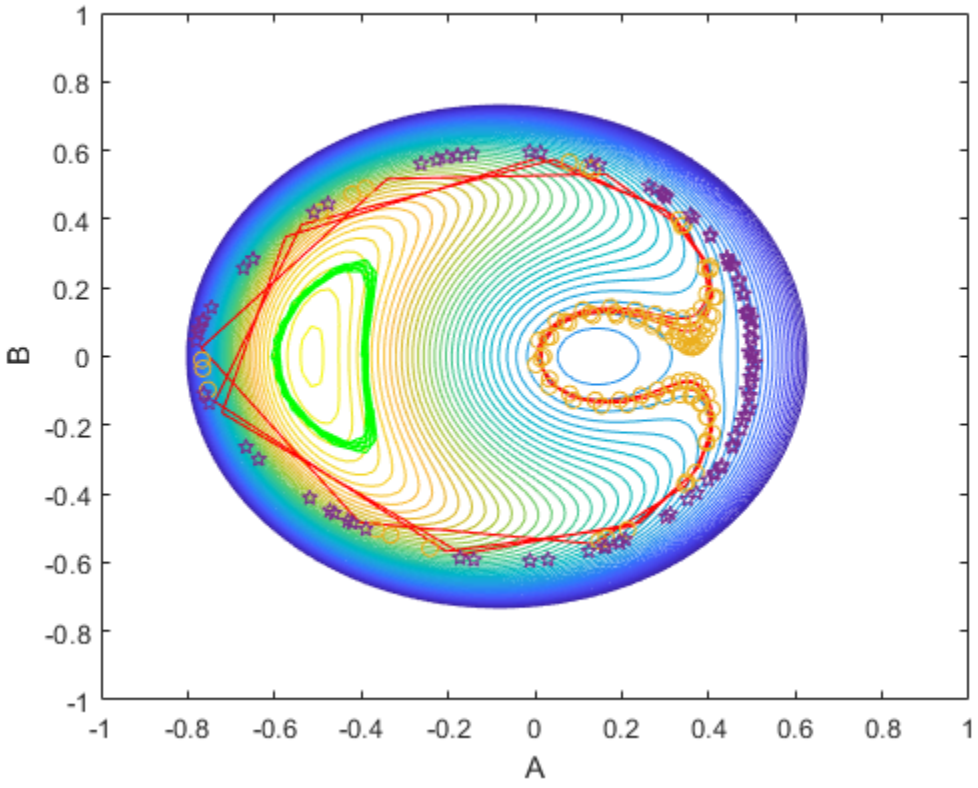
```
%QUESTION 2 iii)

%Based on the plot we have a

%1) CENTER AT (-0.5,0)

%2) CENTER AT (0.15,0)

%3) SADDLE AT (0.37,0)



%QUESTION 2 iv)

%Firstly we plot the Hamiltonian

k=-0.08; %Given
gamma=0.02; %Given

a=linspace(-1,1,100);
b=linspace(-1,1,100);

level=linspace(-0.005,0.01,50); % Since -0.005 <= H <= 0.01.
%Vector from -0.005 to 0.01

[A,B]=meshgrid(a,b);
H=-(gamma*A)/2 -(k/2)*(A.^2+B.^2)-(3/32)*(A.^4+B.^4)-
(3/16)*B.^2.*A.^2; %
% This is the Hamiltonian function H(A,B) that was found in i)
contour(a,b,H,level)
xlabel('A');ylabel('B')

hold on

%Now we plot the Poincare Maps on top of our Hamiltionian

w=k+1;%Given

%IC stand for the Initial Conditions that were given
%Our fode is obtained by taking snapshots of and dx/dt  of the given
%equation
fode=@(t,x) [x(2);gamma*cos(w*t)+x(1)^3-x(1)];
[t,x]=ode45(fode,2*pi/w*[0:100],[0 0]); % At IC (Ao,Bo)=(0,0)
plot(x(:,1),x(:,2),'r')

hold on

fode=@(t,x) [x(2);gamma*cos(w*t)+x(1)^3-x(1)];
[t,x]=ode45(fode,2*pi/w*[0:100],[-0.4 0]);% At IC (Ao,Bo)=(-0.4,0)
plot(x(:,1),x(:,2),'g')
```

```
hold on

fode=@(t,x) [x(2);gamma*cos(w*t)+x(1)^3-x(1)];
[t,x]=ode45(fode,2*pi/w*[0:100],[0.02 0]);%At (Ao,Bo)=(0.02,0)
plot(x(:,1),x(:,2),'o')

hold on

fode=@(t,x) [x(2);gamma*cos(w*t)+x(1)^3-x(1)];
[t,x]=ode45(fode,2*pi/w*[0:100],[0.5 0]);%At (Ao,Bo)=(0.5,0)
plot(x(:,1),x(:,2),'p')
```



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