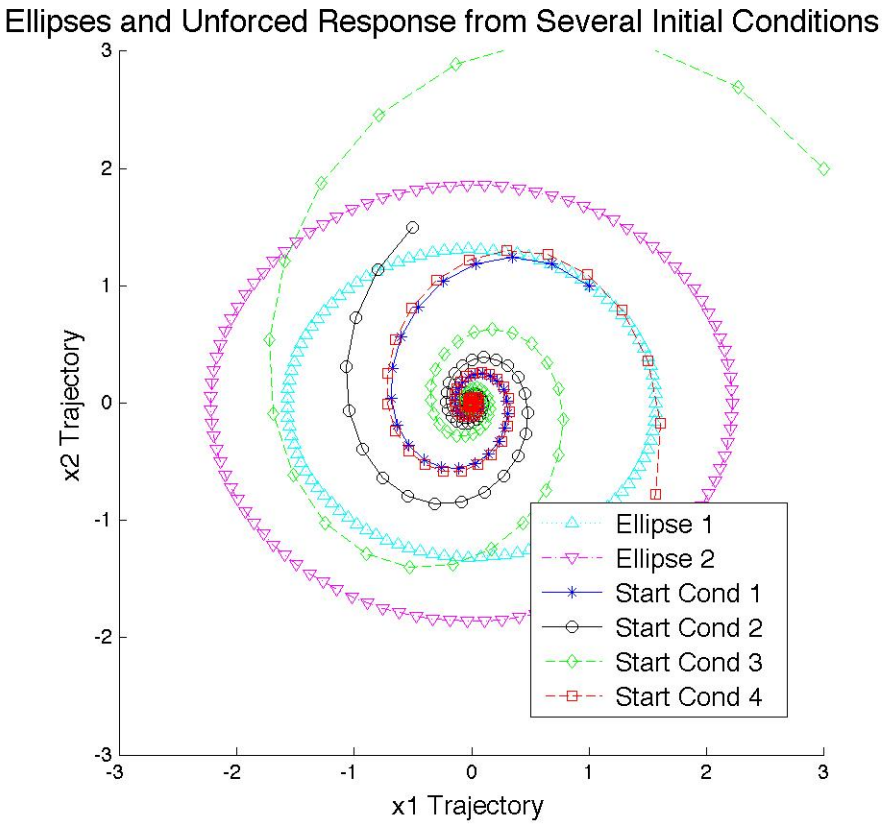
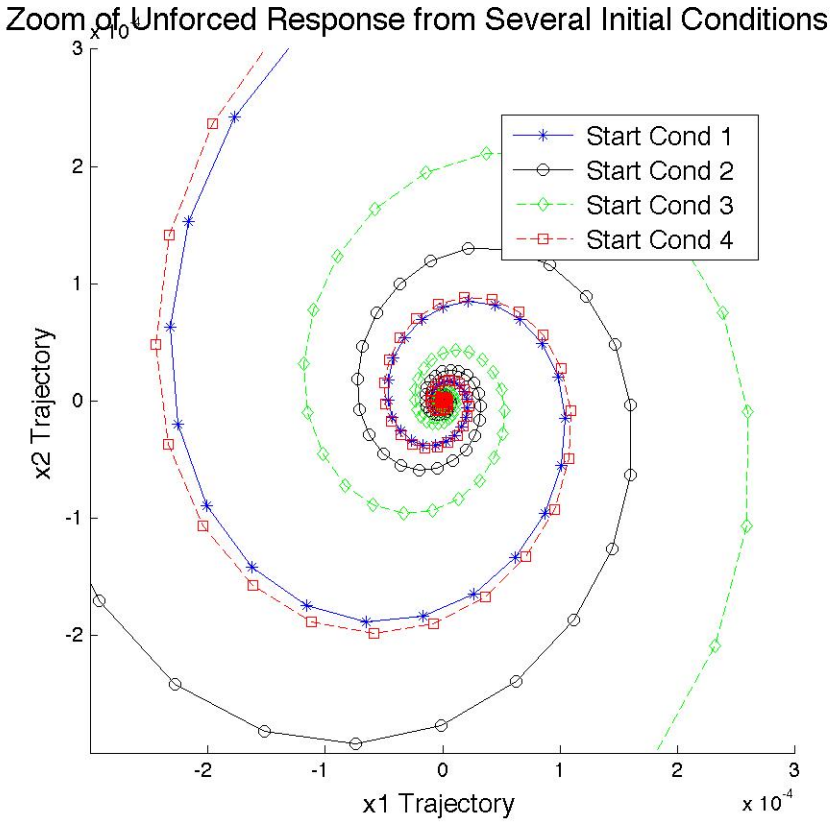

Ellipses and Unforced Response from Several Initial Conditions
x2 Trajectory
x1 Trajectory
Ellipse 1
Ellipse 2
Start Cond 1
Start Cond 2
Start Cond 3
Start Cond 4


Zoom of Unforced Response from Several Initial Conditions
x 10^-4
x2 Trajectory
x1 Trajectory
x 10^-4
Start Cond 1
Start Cond 2
Start Cond 3
Start Cond 4

Note: scale is 10^{-4} for both axes on the "zoom" plot.

```
function HW13_EllipsePlots(zoom)

ABCSolve = [-2,14,0;-5,-3,7;0,-10,-4];
Pmake = eye(3)/ABCSolve*[-1,0,-1]';
P = [Pmake(1),Pmake(3);Pmake(3),Pmake(2)];
A = [-1,-5;7,-2];
B = [0;0];
I = -eye(2);

%First Ellipse, x'Px=1.
a1 = max((1/Pmake(1))^.5,(1/Pmake(3))^.5);
b1 = min((1/Pmake(1))^.5,(1/Pmake(3))^.5);
e1 = ((a1^2-b1^2)/a1^2)^.5;
[lat1, lon1] = ellipse1(0,0,[b1,e1]);

%Second Ellipse, x'Px=2.
a2 = max((2/Pmake(1))^.5,(2/Pmake(3))^.5);
b2 = min((2/Pmake(1))^.5,(2/Pmake(3))^.5);
e2 = ((a2^2-b2^2)/a2^2)^.5;
[lat2, lon2] = ellipse1(0,0,[b2,e2]);

%Create system, get points from several initial conditions, plot
sys = ss(A,[],[],[]);
x_start = [1,-.5,3,1;1,1.5,2,-2];
color = {'-b*','-ko','--gd','--rs',':c^','-.mv'};
figure;
    title('\fontsize{16} Ellipses and Unforced Response from Several Initial Conditions');
    xlabel('\fontsize{13} x1 Trajectory');
    ylabel('\fontsize{13} x2 Trajectory');
    axis square
    axis([-3,3,-3,3]);
    hold on;
    plot(lat1,lon1,color{5},lat2,lon2,color{6});
    t_span = 0:.05:10;

    for jj = 1:4
       [~,~,x] = initial(sys,x_start(:,jj),t_span);
       plot(x(:,1),x(:,2),color{jj});
    end

    legend('\fontsize{13} Ellipse 1',...
        '\fontsize{13} Ellipse 2',...
        '\fontsize{13} Start Cond 1',...
        '\fontsize{13} Start Cond 2',...
        '\fontsize{13} Start Cond 3',...
        '\fontsize{13} Start Cond 4',...
         'Location','Best');
    hold off;
```