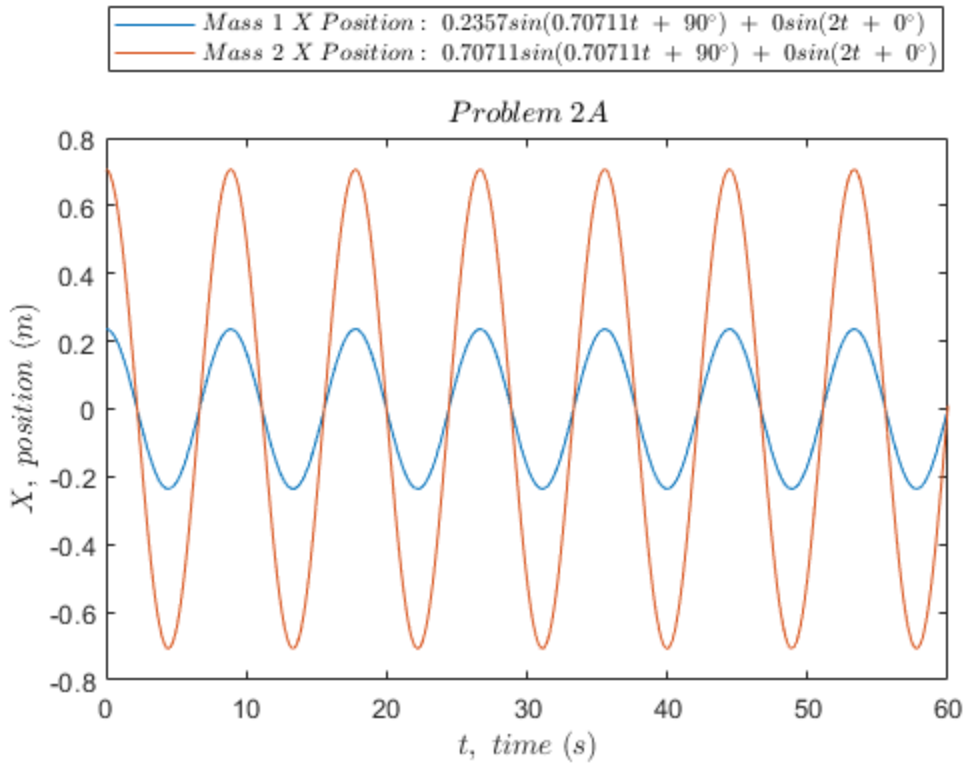
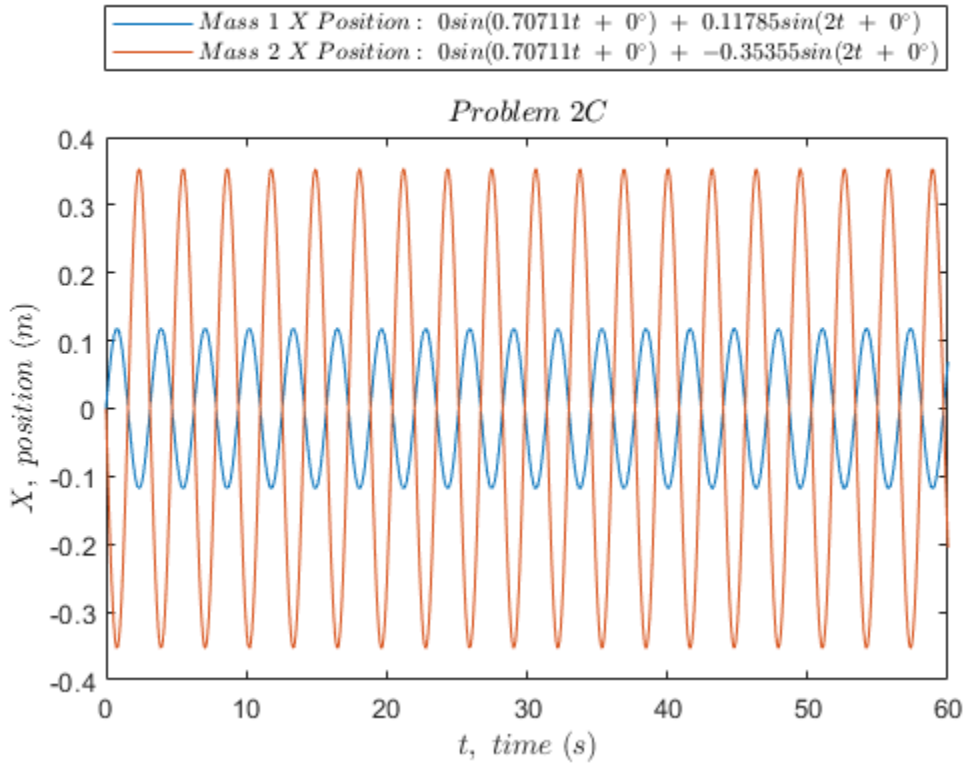
```
clc;
clear;
close all;

res = 1000;
t_max = 60;
t = linspace(0,t_max,res);

w_n_Array = [sqrt(2)/2,2]; %[w_n1, w_n2, ...]

u_vectors_Matrix = [[1,3];[-1,3]]; %[u_1 ; u_2, ...]
%u_1 = [1,3];
%u_2 = [-1,3];

%PHI IS IN DEGREES

%%Part A
A_Array = [sqrt(2)/6,0]; %[A_1,A_2, ...]
phi_Array = [90,0]; %[phi_1, phi_2, ...] in degrees
%NOTE: phi_2 doesn't matter for part A

X_vals = coupledDoFPlotter(A_Array,
 phi_Array,w_n_Array,u_vectors_Matrix,t,"$Problem \ 2A$");

%%Part C
A_Array = [0/2,-sqrt(2)/12]; %[A_1,A_2, ...]
phi_Array = [0,0]; %[phi_1, phi_2, ...] in degrees
%NOTE: phi_1 doesn't matter for part C


X_vals = coupledDoFPlotter(A_Array,
 phi_Array,w_n_Array,u_vectors_Matrix,t,"$Problem \ 2C$");

function [coupledDoFValues] = coupledDoFPlotter(A_Values,
 phi_Values,natFreqs,u_Vectors,t_vals,titled)
    X = zeros([length(A_Values),length(t_vals)]);
    for i = 1:length(A_Values) %gets X mass1, X mass2, ... and selects which u
 vector to use
        %X(i,:) = X(i,:) + A_Values(1)*sin(natFreqs(1)*t_vals +
 phi_Values(1)*180/pi)*u_Vectors(1,i);
        for ii = 1:length(A_Values) %within X mass1, goes thru A_1, A2...,
 phi_1, phi_2..., selects
            %which value in the specified u vector to use
            X(i,:) = X(i,:) + A_Values(ii)*sin(natFreqs(ii)*t_vals +
 phi_Values(ii)*pi/180)*u_Vectors(ii,i);
        end
    end
    coupledDoFValues = X;
    figure;
    for i = 1:length(A_Values)
        plot(t_vals,X(i,:))
        hold on;
```

```
    end
    hold off;
    a = strcat("$Mass \ ", num2str(1)," \ X \ Position$");
    legendStuff = strings(1,length(A_Values)); %creates aray of empty string
    %legendStuff(1) = strcat("$Mass \ ", num2str(1)," \ X \ Position$");
    %legendStuff(2) = strcat("$Mass \ ", num2str(2)," \ X \ Position$");
    %legendStuff = [strcat("$Mass \ ",num2str(1)," \ X \ Position
$"),strcat("$Mass \ ", num2str(2)," \ X \ Position$")];
    for i = 1:length(A_Values)
        a = strcat("$Mass \ ", num2str(i)," \ X \ Position : \ ");
        b = "";
        for ii = 1:length(A_Values)
            if ii > 1
              b = strcat(b, " \ + \ ") ;
            end
            b = strcat(b,
 num2str(u_Vectors(ii,i)*A_Values(ii)),"sin(",num2str(natFreqs(ii)),"t \ + \
 ", num2str(phi_Values(ii)), "^{\circ}  )");
        end
        c = strcat(a,b," $");
        legendStuff(i) = c;
    end
    lgnd= legend(legendStuff,'Location','northoutside');
    set(lgnd, 'Interpreter','latex')
    %lgnd.Location = 'best';
    title(titled,'Interpreter','latex')
    xlabel("$ t, \ time \ (s) $",'Interpreter','latex')
    ylabel("$X, \ position \ (m)$",'Interpreter','latex')
end

%%This is the model
% A_1 = sqrt(2)/2;
% A_2 = 0;
% phi_1 = 90;
% phi_2 = 0; %doesn't matter for part A
%
% u_1 = [1;3];
% u_2 = [-1;3];
%
% X= [;];
% X(1,:) = A_1*sin(w_n1*t + phi_1*180/pi)*u_1(1) + A_2*sin(w_n2*t + phi_2*180/
pi)*u_2(1);
% X(2,:) = A_1*sin(w_n1*t + phi_1*180/pi)*u_1(2) + A_2*sin(w_n2*t + phi_2*180/
pi)*u_2(2);
```


Mass 1 X Position: 0.2357sin(0.70711t + 90°) + 0sin(2t + 0°)
Mass 2 X Position: 0.70711sin(0.70711t + 90°) + 0sin(2t + 0°)
Problem 2A
X, position (m)
t, time (s)
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
0
10
20
30
40
50
60


Mass 1 X Position: 0sin(0.70711t + 0°) + 0.11785sin(2t + 0°)
Mass 2 X Position: 0sin(0.70711t + 0°) + −0.35355sin(2t + 0°)
Problem 2C
X, position (m)
t, time (s)
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
0
10
20
30
40
50
60