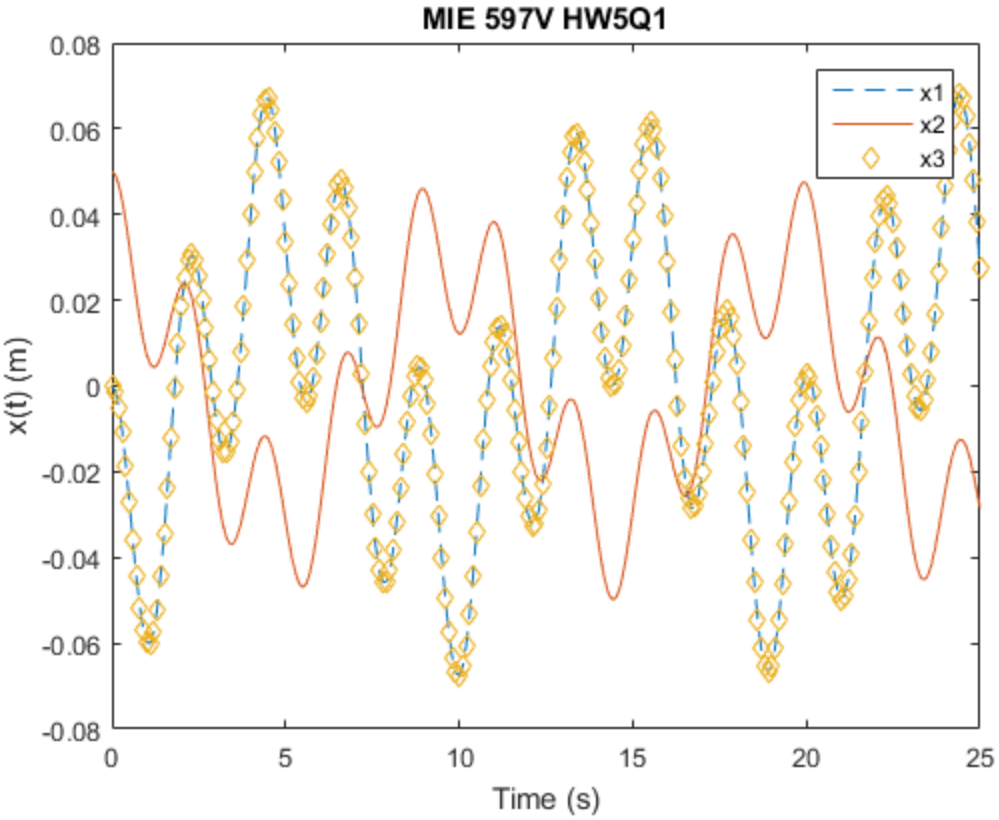
```
syms w X1 X2 X3;
% Initial conditions
x1_0 = 0;
x2_0 = .05;
x3_0 = 0;
x1_dot_0 = 0;
x2_dot_0 = 0;
x3_dot_0 = 0;
X = [X1; X2; X3];
% Creates M-matrix
m = 200;
M = eye(3)*m;
% Creates K-Matrix
E = .6*10^9;
l = 2;
I = 4.17*10^-5;
k = [9/64 1/6 13/192; 1/6 1/3 1/6; 13/192 1/6 9/64];
K = E*I/l^3*k;
% Creates A-matrix
A = -M*w^2+K;
% Finds characteristic equation and sets to 0 to solve for nat. freq.
char_eq = det(A);
wn = sort(double(solve(char_eq == 0)));
% Finds the corresponding mode shapes for nat. freq.
for i = 1:3
    A_new(i).w = double(subs(A, w, wn(i+3)));
    A_new(i).modes = rref(A_new(i).w);
    disp(wn(i+3));
    disp(A_new(i).w);
    disp(A_new(i).modes);
end

% Solves for x-vector and x_dot-vector
x = rref([1 1 1 0; -.917 0 .544 .05; 1 -1 1 0]);
x_dot = rref([.649 1.07 2.83 0; -.595 0 1.59 0; .649 -1.07 2.83 0]);
disp(x);
disp(x_dot);

% Plots as function of time
t = [0:.1:25];
x1 = -.0342*sin(.649.*t+pi/2)+.0342*sin(2.83.*t+pi/2);
x2 = (-.917)*(-.0342*sin(.649.*t+pi/2))+.544*(.0342*sin(2.83.*t
+pi/2));
x3 = -.0342*sin(.649.*t+pi/2)+.0342*sin(2.83.*t+pi/2);
plot(t, x1,'--', t, x2, t, x3, 'd');
title('MIE 597V HW5Q1');
xlabel('Time (s)');
ylabel('x(t) (m)');
legend('x1', 'x2', 'x3');
```

```
    0.6496

  355.4078  521.2500  211.7578
```

```
521.2500  958.1031  521.2500
211.7578  521.2500  355.4078

  1.0000         0   -1.0000
       0    1.0000    1.0881
       0         0         0

  1.0678

211.7578  521.2500  211.7578
521.2500  814.4531  521.2500
211.7578  521.2500  211.7578

   1     0     1
   0     1     0
   0     0     0

  2.8370

 1.0e+03 *

 -1.1699    0.5212    0.2118
  0.5212   -0.5672    0.5212
  0.2118    0.5212   -1.1699

  1.0000         0   -1.0000
       0    1.0000   -1.8381
       0         0         0

  1.0000         0         0   -0.0342
       0    1.0000         0         0
       0         0    1.0000    0.0342

   1     0     0     0
   0     1     0     0
   0     0     1     0
```

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