```
% Benjamin Stutzke
% ENAE 423
% Homework 3
```

Problem 1

Part A

```
k = [1 0 -1; 0 1 -1; -1 -1 3];
M = [1 0 0; 0 1 0; 0 0 1];

[X, D] = eig(k, M);

% D should contain all omega^2 values on diag
% X contains eigenvectors as columns

p_bar = diag(D);
freq = sqrt(p_bar) % natural frequency = freq*sqrt(k/m)

X_norm = bsxfun(@rdivide, X, max(abs(X)))

% Part C
phi_1 = X_norm(:, 1);
phi_2 = X_norm(:, 2);

phi_1'*k*phi_2
phi_1'*M*phi_2
```

```
freq =

    0.5176
    1.0000
    1.9319


X_norm =

    1.0000    1.0000   -0.3660
    1.0000   -1.0000   -0.3660
    0.7321    0.0000    1.0000


ans =

  -5.5511e-17


ans =

   2.2204e-16
```

Problem 2

Part A

```
k = [1 0 -1; 0 1 -1; -1 -1 2];
M = [1 0 0; 0 1 0; 0 0 1];

[X, D] = eig(k, M);

% D should contain all omega^2 values on diag
% X contains eigenvectors as columns

p_bar = diag(D);
freq = sqrt(p_bar) % natural frequency = freq*sqrt(k/m)

X_norm = bsxfun(@rdivide, X, max(abs(X)))

% Part C
phi_1 = X_norm(:, 1);
phi_2 = X_norm(:, 2);

phi_1'*k*phi_2
phi_1'*M*phi_2
```

```
freq =

   0.0000 + 0.0000i
   1.0000 + 0.0000i
   1.7321 + 0.0000i


X_norm =

    1.0000    1.0000   -0.5000
    1.0000   -1.0000   -0.5000
    1.0000    0.0000    1.0000


ans =

  -2.2204e-16


ans =

   3.3307e-16
```

Published with MATLAB® R2022b