```
A = [1, 0, sqrt(2);
     0, 2, 0;
     sqrt(2), 0, 0;];

v1 = [0; 1; 0];  % Transpose not necessary since it's already a column vector

D1 = A * v1;  % Matrix-vector multiplication
D2 = 2 * v1;  % Scalar multiplication

% Display results separately
disp('D1 = ');
disp(D1);% Step A

disp('D2 = ');
disp(D2);% step A

[V,D] = eig(A)

v2 = [0.5774;0;-0.8165;];

v3 = [0.8165;0;0.5774];

dot_v1_v2 = dot(v1, v2);  % Should be 0
dot_v1_v3 = dot(v1, v3);  % Should be 0
dot_v2_v3 = dot(v2, v3);  % Should be 0

disp('Dot product of v1 and v2:');
disp(dot_v1_v2);% Step B

disp('Dot product of v1 and v3:');
disp(dot_v1_v3);% Step B

disp('Dot product of v2 and v3:');
disp(dot_v2_v3);% Step B

V = [v1,v2,v3];% Step B

disp(V);% Step B
disp(V'*V);% Step B

L = V'*A*V;

disp(L);% Step C

A2 = [-1.0001, 0.0001;
    0.0001, 2.0001;];

[U2,D1]=eig(A2)% step D
disp(U2*U2');% step D

X = U2'*A2*U2;
disp(X) %step D

U = [1, 0, 0;
    0,-1.000,0;
    0,0,1.000];%Step E
```

```
disp(U*U');

O = V*U;
disp(O);
disp(O*O');%Step F

Lambda = O'*A*O;
disp(Lambda);% step g
```

```
D1 =
     0
     2
     0

D2 =
     0
     2
     0


V =

    0.5774    0.8165         0
         0         0   -1.0000
   -0.8165    0.5774         0


D =

   -1.0000         0         0
         0    2.0000         0
         0         0    2.0000

Dot product of v1 and v2:
     0

Dot product of v1 and v3:
     0

Dot product of v2 and v3:
     0

         0    0.5774    0.8165
    1.0000         0         0
         0   -0.8165    0.5774

    1.0000         0         0
         0    1.0001         0
         0         0    1.0001

    2.0000         0         0
         0   -1.0001    0.0001
         0    0.0001    2.0001


U2 =
```

```
   -1.0000    0.0000
    0.0000    1.0000


D1 =

   -1.0001         0
         0    2.0001

     1     0
     0     1

   -1.0001         0
         0    2.0001

     1     0     0
     0     1     0
     0     0     1

         0   -0.5774    0.8165
    1.0000         0         0
         0    0.8165    0.5774

    1.0001         0         0
         0    1.0000         0
         0         0    1.0001

    2.0000         0         0
         0   -1.0001   -0.0001
         0   -0.0001    2.0001
```

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