Exercise 2

```
type closetozeroroundoff
```

```
function B=closetozeroroundoff(A,p)
A(abs(A)<10^-p)=0;
B=A;
end
```

```
type symmetric
```

```
%Creates the function symmetric
function [] = symmetric(A)

n = size(A,1);      %Creates nxn matrix
p = 7;              %p=7 for closetozeroroundoff function
x = isequal(A,A');  %Checks for symmetry statement

%If not, outputs msg that matrix is not symmetric and terminates program
if x == 0
    fprintf('A is not symmetric')
    return
end

%Constructs an orthogonal diagonalization
[P,D] = eig(A)

%Verifies for orthogonal diagonalization
if closetozeroroundoff(A*P-P*D,p) == zeros(n) & ...
        closetozeroroundoff(inv(P)-P',p) == zeros(n)
    disp('AP = PD and P is orthogonal')
else
    disp('What is wrong?!')
end
end %end of function
```

```
%(a)
A=[2 -1 1;-1 2 -1;1 -1 2]
```

```
A = 3×3
     2    -1     1
    -1     2    -1
     1    -1     2
```

```
symmetric(A)
```

```
P = 3×3
    0.4082    0.7071   -0.5774
   -0.4082    0.7071    0.5774
   -0.8165         0   -0.5774
D = 3×3
    1.0000         0         0
         0    1.0000         0
         0         0    4.0000
AP = PD and P is orthogonal
```

```
%(b)
A=[2 -1 1;-1 2 -2;1 -1 2]
```

```
A = 3×3
     2    -1     1
    -1     2    -2
```

```
     1    -1     2
```

```
symmetric(A)
```

```
A is not symmetric
```

```
%(c)
B=A*A'
```

```
B = 3×3
     6    -6     5
    -6     9    -7
     5    -7     6
```

```
symmetric(B)
```

```
P = 3×3
   -0.0820    0.8577    0.5075
    0.5912    0.4518   -0.6681
    0.8024   -0.2453    0.5441
D = 3×3
    0.3315         0         0
         0    1.4096         0
         0         0   19.2588
AP = PD and P is orthogonal
```

```
%(d)
A=[3 1 1;1 3 1;1 1 3]
```

```
A = 3×3
     3     1     1
     1     3     1
     1     1     3
```

```
symmetric(A)
```

```
P = 3×3
    0.4082    0.7071    0.5774
    0.4082   -0.7071    0.5774
   -0.8165         0    0.5774
D = 3×3
    2.0000         0         0
         0    2.0000         0
         0         0    5.0000
AP = PD and P is orthogonal
```

```
%(e)
A=[5 8 -4;8 5 -4;-4 -4 -1]
```

```
A = 3×3
     5     8    -4
     8     5    -4
    -4    -4    -1
```

```
symmetric(A)
```

```
P = 3×3
    0.2902    0.6865    0.6667
    0.1797   -0.7234    0.6667
    0.9399   -0.0737   -0.3333
D = 3×3
   -3.0000         0         0
```

```
         0   -3.0000         0
         0         0   15.0000
AP = PD and P is orthogonal
```

```
%(f)
A=[4 3 1 1; 3 4 1 1 ; 1 1 4 3; 1 1 3 4]
```

```
A = 4×4
     4     3     1     1
     3     4     1     1
     1     1     4     3
     1     1     3     4
```

```
symmetric(A)
```

```
P = 4×4
   -0.0000    0.7071   -0.5000    0.5000
         0   -0.7071   -0.5000    0.5000
   -0.7071    0.0000    0.5000    0.5000
    0.7071         0    0.5000    0.5000
D = 4×4
    1.0000         0         0         0
         0    1.0000         0         0
         0         0    5.0000         0
         0         0         0    9.0000
AP = PD and P is orthogonal
```