Name: _____

Date: _____

Collaborators: _____

(Collaborators submit their individually written assignments together)

Question:	1	2	3	4	5	Total
Points:	20	20	15	5	10	70
Score:						

Instructor/grader comments:

QR algorithm

1. (20 points) Write the matlab function with the following calling and return parameters

```
function [Q, R] = myqr(A)
%MYQR  QR decomposition of a symmetric square matrix A
```

that implements QR decomposition of matrix A. Use the code for `hqr` and `happly` functions that we discuss in class.

Test you function using the code similar to the following.

```
n = 20;
A = gensmspectr(n);
[Q, R] = myqr(A);
norm(Q*R - A, inf)
```

The code for gensmspectr() is provided on the course website.

Place you testing code to the file named **hw06a.m** and submit it as a part of this assignment.

2. (20 points) Write the matlab function with the following calling and return parameters

```
function eig = myeig(A, tol)
% MYEIG Find all eigenvalues of a symmetric matrix using
%       home made implementation of QR algorithm
```

that uses QR algorithm to find all eigenvalues of a symmetric matrix. Use the code for `myqr` that you developed in Problem 1.

As you convergence test use the following

```
while err > tol
```

where

```
err = norm(diag(A, 1));
```

Compare the eigenspectrum returned by tour code with the the results produced by matlab `eig` function.

```
n = 20;
A = gensmspectr(n);
```

```
e1 = myeig(A, 0.0000001);
e2 = eig(A);
norm(sort(e1) - sort(e2), inf)
```

Place you testing code to the file named **hw06b.m** and submit it as a part of this assignment.

3. (15 points) Use the code to investigate how the running time of your code depends on the size of the matrix n. Use matlab script similar to the following:

```
imax = 6;
mytiming = zeros(imax, 1);

for i = 1:imax
n = 2^i;
  A = gensmspectr(n);
  tol = 0.00000001;

  tic();
  e1 = myeig(A, tol);
  mytiming(i) = toc();
end

plot(1:imax, log2(mytiming))
```

make sure you run you code several times. If the graph is (approximately) linear, determine the slope. Place the code you wrote for this part of the homework in a single matlab file, e.g. **hw06c.m**

4. (5 points) Clearly describe your observations and conclusions in your project's readme file.

Gitlab

5. (10 points) Create a gitlab project called **hw06** (name it exactly as shown). Upload **all** required matlab code and create your readme file. Share the project with the instructor.