Name: _____

Date: _____

Collaborators: _____

(If applicable, the collaborators submit their individually written assignments together)

Question:	1	2	3	Total
Points:	20	20	10	50
Score:				

Instructor/grader comments:

Power iterations

1. (20 points) Modify the code of the matlab function `poweriter` that we used in class so that (a) it returns the result not after a predefined number of iterations but when the absolute value of the difference between two successive approximations for the eigenvalue is smaller than a give tolerance; (b) it uses two-norm (instead of infinity-norm) for all calculations; (c) it uses Rayleigh quotient to estimate the eigenvalue. Call the function `hw02poweriter`. Use the following calling and return parameters:

```
function [gamma, n, x] = hw02poweriter(A, tol, maxiter)
% HW02POWERITER Power iteration for the dominant eigenvalue.
```

   where *gamma* is the sequence of eigenvalue approximations, n is the actual number of iterations, x is the eigenvector approximation.

2. (20 points) Use a 5x5 random matrix with eigenvalues $1, 2 \ldots 5$, e.g.

```
nn = 5;
lambda = 1:nn;
[Q, R] = qr(rand(nn, nn));
A = Q*diag(lambda)*Q';
```

   and the following parameters,

```
tol = 0.0000001;
maxiter = 100;
```

   to test your function. Plot the error of the eigenvalue approximations vs. the number of iteration. Use Matlab `semilogy` function for plotting.

   In the same figure plot the graph of the function $\left[(\lambda(2)/\lambda(1))^2\right]^n$ where n is the number of iterations and $\lambda(1)$ and $\lambda(2)$ are the largest and the second-largest eigenvalues of the matrix A.

   Provide axes labels, legend, title, and grid for your graph.

   Place the commands `clear`, `clf` at the top of your script. Seed your random number generator before generation the random matrix.

   Place the test code into Matlab file named **hw02p2.m**.

   In your README.md file describe your results and your conclusions regarding the convergence of the power iteration method.

Gitlab

3. (10 points) Create a gitlab project called **hw02** (name it exactly as shown). Upload **all** Matlab files that are needed to run your code.

   Create README.md file and write in there your answer to Problem 2.

   Share the project with the instructor and the grader and grant them **Reporter** privileges.