Name: _____

Date: _____

Collaborators: _____

(Collaborators submit their individually written assignments together)

Question:	1	2	3	4	5	6	Total
Points:	10	15	10	20	20	10	85
Score:							

Instructor/grader comments:

Course logistics

1. (10 points) I've deleted my old homework project from my gitlab account

   Sign and date here: _____

2. (15 points) I've read and understood the homework guidelines that are posted on the course website `https://www.phys.uconn.edu/~rozman/Courses/m3511_20s/homework.html#guidelines`

   Sign and date here: _____

3. (10 points) I understand that any access to gitlab repositories of my examination projects made after the end of the exams is a case of academic misconduct

   Sign and date here: _____

Rayleigh quotient

4. The range of the function $R_A(\vec{x})$ is a subset of the complex plane known as the *field of values* of the matrix A.

   (a) (10 points) Write a matlab script (call it **hw01p4.m**) that use 1000 random complex vectors to plot points in the field of values of

   $$A = \begin{pmatrix} 1 & 0 & -2 \\ 0 & 2 & 0 \\ -2 & 0 & 1 \end{pmatrix}$$

   (b) (5 points) continue developing your script by calculating (and printing) the eigenvalues of A

   (c) (5 points) Guess (and describe below) what is the exact field of values for A.

Similarity transformation

5. (20 points) Recall that for the matrix

   $$A = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix},$$

   $$A \begin{pmatrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{pmatrix} = \begin{pmatrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{pmatrix}$$

   and

   $$A \begin{pmatrix} \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} \end{pmatrix} = -\begin{pmatrix} \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} \end{pmatrix}.$$

   Define a function of a matrix using function's Taylor series. Find $\sin(At)$ where t is a real parameter. Show all your work.

Gitlab

6. (10 points) Create a gitlab project called **hw01** (name it exactly as shown). Upload **all** required matlab code and create an empty README.md file. Share the project with the instructor and the grader.