AMCS 602 Fall 2017
Homework Set II, Due Sept. 20, 2017

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Reading: Read the Lecture 4 - 6 of Trefethen and Bau: *Numerical Linear Algebra*, which is published by SIAM. Page numbers below refer to this book. The solutions of the following problems should be carefully written up and handed in.

1. Show that in general, for square matrix $A \in \mathbb{C}^{m \times m}$, the largest singular value $\sigma_1(A)$ of A does not equal to the spectral radius $\rho(A)$ of A. Recall that

$$\sigma_1(A) = \|A\|_2 = \sup_{\|x\|_2 = 1} \|Ax\|_2$$

while
$$\rho(A) = \max\{|\lambda| | \lambda \ is \ an \ eigenvalue \ of \ A\}.$$

Under what conditions, $\sigma_1(A) = \rho(A)$?

2. Page 30, problem 4.1 part c) and part e).

3. Page 31, problem 4.4.

4. Prove Theorem 5.9 on page 36. Hint: You can reduce to the case that A is a diagonal matrix.

5. Page 37, problem 5.2, 5.4.

6. Page 47, problem 6.4, 6.5.