

AMCS 602 Fall 2017
Homework Set III, Due Oct. 2, 2017

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Reading: Read the Lecture 7 - 10 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. Page 55, Problem 7.3. And under what conditions will the equality be true?
2. Page 68, Problem 9.2.
3. Page 76, Problem 10.1.
4. Page 76, Problem 10.4.
5. Explain how to modify the definition of the Householder reflector so that it works for a vector with complex entries. That is, given $x \in \mathbb{C}^m$, how should we define the unit vector v and the phase $e^{i\theta}$, so that $(Id - 2vv^*x) = e^{i\theta}\|x\|e_1$?
6. If $P : \mathbb{R}^m \rightarrow \mathbb{R}^m$ is an orthogonal projection of rank $k < m$, then find a basis for \mathbb{R}^m in which the action of the reflection $R_P = Id - 2P$ is as simple as possible, and explain what that is. What is $\det R_P$?