Math 6610 Problem Set 1
Due date to be announced

NOTE: Homework is due at the time specified above. Late homework is **not** acceptable because we may go over (some) homework problems in class.

1 Trefethen page 9, problem 1.1

2 Trefethen page 10, problem 1.3

3 Trefethen page 15, problem 2.1

4 Trefethen page 16, problem 2.4 (Note that this problem asks you to show that for a unitary matrix, all of its eigenvalues have magnitude 1. Once you have shown this, it follows that the determinant of any unitary matrix has magnitude 1. This is because the determinant of a matrix is the constant term in its characteristic polynomial. Since the eigenvalues are the roots of this polynomial, the constant term is also $\pm$ the product of the eigenvalues of the matrix.)

5 Trefethen page 16, problem 2.5

6 Trefethen page 16, problem 2.6

7 Trefethen page 24, problem 3.2

8 Trefethen page 24, problem 3.4

9 Show that $\|QAZ\|_F = \|A\|_F$, where $A \in \mathbf{C}^{m \times n}$, $Q \in \mathbf{C}^{m \times m}$ is unitary, and $Z \in \mathbf{C}^{n \times n}$ is unitary.

10 Prove that if $W \in \mathbf{C}^{m \times m}$ is an arbitrary nonsingular matrix, and $\| \cdot \|$ is any norm on $\mathbf{C}^m$, then $\|x\|_W = \|Wx\|$ is a norm on $\mathbf{C}^m$.