# MATH 307

## Group Homework 7

Instructions: Read textbook pages 145 to 147 before working on the homework problems. Show all steps to get full credits.

1. Let A be a matrix such that the entries in each row add up to 1. Show that the vector with all entries qual to 1 is an eigenvector. What is the corresponding eigenvalue?

2. For an $n \times n$ matrix $A$ prove that:

   (a) If $\lambda$ is an eigenvalue, $u$ a corresponding eigenvector $c$ a scalar, then $\lambda + c$ is an eigenvalue of $A + cI$ and $u$ is a corresponding eigenvector.

   (b) If the entries of each row of $A$ add up to 0, then 0 is an eigenvalue, and thus the matrix is not invertible.

3. Let $Q$ be a unitary matrix and $\lambda$ be an eigenvalue of $Q$, prove that $|\lambda| = 1$.