MATH 260 — HOMEWORK 3.

due on Friday, February 2.

by Tom M. Apostol

Topics:
• Chapter 5. Eigenvalues of Operators Acting on Euclidean Spaces
  – 5.1 Eigenvalues and inner products
  – 5.2 Hermitian and skew-Hermitian transformations
  – 5.3 Eigenvalues and eigenvectors of Hermitian and skew-Hermitian operators
  – 5.4 Orthogonality of eigenvectors corresponding to distinct eigenvalues
  – 5.6 Existence of an orthonormal set of eigenvectors for Hermitian and skew-Hermitian operators acting on finite-dimensional spaces
  – 5.7 Matrix representations for Hermitian and skew-Hermitian operators
  – 5.8 Hermitian and skew-Hermitian matrices
  – 5.9 Diagonalization of a Hermitian or skew-Hermitian matrix

Third Homework Assignment.

Reading:
• Read Sections 5.1 to 5.4 and 5.6 to 5.9 from the book. Read your notes.

Problems: Make sure you can do all the Problems in Sections 4.10, 5.5, and 5.11, but write up (only) the following problems to be handed in:

1. Section 4.10 (page 112): 1, 2, 4, 8
   • In problems 2 and 4 check the Cayley-Hamilton Theorem, that is compute \( f(A) \), (where \( f(\lambda) \) is the characteristic polynomial of \( A \)) and show that you get zero.

2. Section 5.5 (page 118): 1, 3, 6,
3. Section 5.11 (page 124): 1, 5, 6, 8
   • For the matrix in Problem 1 (d), find its expression as a skew-Hermitian real matrix, as given in class.