MthSc 853 — Goddard — Fall09

Practice Test 3

1. State and prove the Complex Spectral Theorem.

2. We showed earlier that the set of real $n \times n$ self-adjoint matrices form a vector space over $\mathbf{R}$. Determine the dimension of the space and give a basis.

3. Consider the operator $T : \mathbf{R}^2 \to \mathbf{R}^2$ which with respect to the standard basis is given by

$$\begin{pmatrix} 2 & 0 \\ 1 & 1 \end{pmatrix}$$

   (a) Is T positive?
   (b) Does T have a square-root? If so, find one.
   (c) Is T an isometry?
   (d) Find the singular values of T.

4. Pick **one** of the following topics and write a couple of paragraphs on it:

   (a) Vandermonde matrices
   (b) Tverberg's theorem
   (c) The Page-Rank algorithm
   (d) Principal Component Analysis