DOCTORAL QUALIFYING EXAMINATION

FALL 2000

Linear Algebra & Analysis

Solve any three problems for a full credit. Indicate below EXACTLY which three problems you have attempted by circling the appropriate numbers:

1   2   3   4

NAME: ______________________________________

ID#: ______________________________________

Start your answer on each question sheet. Attach all extra sheets you use to the appropriate sheet. Hand in all question sheets.

Date:	September 5, 2000
Time of Exam:	3:30PM-4:30PM
Place of Exam:	Social Behavioral Science Bldg., Room S228

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ID # ________________

2. Let L denote the vector space of $n \times n$ matrices with real coefficients. For two elements A and B, define $< A, B > = tr(AB^*)$, where B^* denotes the transpose of B.

(i) Show that $< . , . >$ defines an inner product (= dot product) on L.

(ii) Let S be the subspace of L consisting of symmetric matrices. Determine the orthogonal complement of S and prove your assertion.

ID # ____________

4. A real-valued function f defined on the real line R is said to be **periodic** if there exists a number $k > 0$ such that $f(x + k) = f(x)$ for all $x \in R$. Suppose that $f: R \to R$ is continuous and periodic. Prove that f is bounded and uniformly continuous on R.