MATH 54

PROFESSOR KENNETH A. RIBET

First Midterm Examination

September 28, 2005

2:10–3:00 PM

Name:

GSI's Name:

SID:

Special Status (e.g., Math 49 or Concurrent Enrollment):

Please put away all books, calculators, electronic games, cell phones, pagers, .mp3 players, PDAs, and other electronic devices. You may refer to a single 2-sided sheet of notes. Your paper is your ambassador when it is graded. Correct answers without appropriate supporting work will be regarded with great skepticism. Incorrect answers without appropriate supporting work will receive no partial credit. This exam has six pages. Please write your name on each page. At the conclusion of the exam, please hand in your paper to your GSI.

Problem	Your score	Possible points
1		6 points
2		16 points
3		8 points
Total:		30 points

1. Find the inverse of the matrix $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 3 & 2 & -1 \\ -1 & 1 & 0 & 0 \\ -1 & 1 & 1 & 0 \end{bmatrix}$.

2. Label the following statements as TRUE or FALSE, *giving a short justification for your choice.* There are six parts to this problem, two per page.

a. The product of two elementary 3×3 matrices is never an elementary matrix.

b. If A is an $n \times n$ matrix and B is a column of length n, the equation $AX = B$ has either infinitely many solutions or exactly one solution.

c. If A and B are rectangular matrices for which AB is an invertible square matrix, then A and B are square matrices and both are invertible.

d. The null space of $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 9 & 7 \end{bmatrix}$ is a subspace of $\mathbb{R}^3$.

e. The set of 4×4 matrices A for which $A \begin{bmatrix} 1 \\ 2 \\ 3 \\ 5 \end{bmatrix} = \begin{bmatrix} 5 \\ 3 \\ 2 \\ 1 \end{bmatrix}$ is a subspace of the space of all 4×4 matrices.

f. If $\mathbf{v}_1, \ldots, \mathbf{v}_4$ are linearly independent and $\mathbf{v}_2, \ldots, \mathbf{v}_5$ are linearly independent, then the vectors $\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_5$ are linearly independent.

3. Find b so that $(-1, b, 2, 3)$ is in the span of $(1, 2, 3, 4)$ and $(3, 4, 4, 5)$.

Find all vectors in $\mathbb{R}^4$ that are perpendicular to both $(1, 2, 3, 4)$ and $(3, 4, 4, 5)$.