APPLIED MATRIX THEORY
Math 551
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Exam I
September 19, 1994

Name ____________________

No notes or books!

I. Short answers (5 pts/part)

1. A) Is it possible to multiply $\begin{pmatrix} 1 & 3 \\ 2 & 5 \end{pmatrix}$ by $\begin{pmatrix} 3 & 6 & 8 \\ 4 & 2 & 7 \\ 6 & 1 & 3 \end{pmatrix}$ in either order?

B) Why or why not?

2. A) If a system of linear equations with an equal number of unknowns and equations has 3 solutions, does it necessarily have a fourth solution?

B) What can we say about its matrix?

3. A) If the matrices A and B are such that AB exists, does BA necessarily also exist?

B) If not, give a counter example; if so, give a proof.

4. If the reduced row echelon form of a matrix is not the identity, is the matrix invertible?

5. Write a 5×5 matrix which has the effect of adding the second row of another matrix to its fourth row when we multiply on the left by it.

II. Computations (15 pts)

1. Find the inverse matrix of

$$\begin{pmatrix} 2 & 3 \\ 3 & 1 \end{pmatrix}$$

2. Use the result of 1 to solve the system

$$\begin{aligned} 2x + 3y &= 4 \\ 3x + y &= 2 \end{aligned}$$

3. Find conditions on b_1, b_2, b_3 so that

$$\begin{aligned} x + 2y + 3z &= b_1 \\ y + 2z &= b_2 \\ 2x + 5y + 8z &= b_3 \end{aligned}$$

has a solution.

III. Calculate the following (5 pts)

A) $\begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & -2 \end{pmatrix}^5$

B) $\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}^{-1}$

C) $\begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}$