

Your Name:

SS#:

M301. Fall, 2000. Instructor: Yuxi Zheng

Exam 1 (150 points)

1. (30pt) Identify which of the following is in row echelon form or reduced row echelon form

$$(a) \begin{pmatrix} 1 & 0 & 0 & 7 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 9 \end{pmatrix} \quad (b) \begin{pmatrix} 1 & 2 & 0 & 4 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 3 \end{pmatrix} \quad (c) \begin{pmatrix} 1 & 2 & 0 & 3 & 0 \\ 0 & 0 & 3 & 4 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

2. (20pts) Solve the system of equations by using augmented matrix, Gauss elimination, and back substitution:

$$3x_1 - 3x_2 + 3x_3 = 9$$

$$2x_1 - x_2 + 4x_3 = 7$$

$$3x_1 - 5x_2 - x_3 = 7$$

3. (20pts) Find the product  $AB$  for the given matrices

$$A = \begin{pmatrix} 1 & 2 \\ 3 & -1 \end{pmatrix} \quad B = \begin{pmatrix} 0 & 1 & 3 \\ -1 & 0 & -2 \end{pmatrix}$$

4. (20pt) Compute the  $LU$  factorization of the matrix

$$\begin{pmatrix} 1 & 1 & 1 \\ 3 & 5 & 6 \\ -2 & 2 & 7 \end{pmatrix} =$$

5. (20pts) Find the inverse  $A^{-1}$  of the matrix

$$A = \begin{pmatrix} 2 & 0 & 5 \\ 0 & 3 & 0 \\ 1 & 0 & 3 \end{pmatrix}$$

6. (10pts) Let  $I$  denote the  $n \times n$  identity matrix. Find the product of the following two partitioned  $2n \times 2n$  matrices

$$\begin{pmatrix} I & O \\ B & I \end{pmatrix} \quad \begin{pmatrix} I & O \\ C & I \end{pmatrix}$$

7. (30pts) Identify true or false to each of the following statements:

- (a) If  $AC = BC$  for three  $2 \times 2$  matrices  $A$ ,  $B$ , and  $C$ , then  $A = B$ .
- (b) There holds  $AB = BA$  for any pair of square matrices  $A$  and  $B$ .
- (c) There holds  $\alpha A = A\alpha$  for any matrix  $A$  and any number  $\alpha$ .