Math 571

Spring 2004

Quiz 1

Instructions: Each question is worth 5 points. You may use any notes or books but you must work individually. The only computation aid which you may use is MATLAB, unless otherwise indicated. Make sure to write clearly and justify your answers.

(1.) Consider the following linear system:

$$\begin{aligned} x_1 + 2x_2 - x_3 &= 3 \\ 2x_1 + x_2 + 7x_3 &= 6 \\ -x_1 + \alpha x_3 &= \beta \end{aligned}$$

(a.) Write down the augmented matrix of this system.

(b.) Find the values of α and β such that this system has no solution, a unique solution and infinitely many solutions.

(2.) Consider the following linear system:

$$\begin{aligned} x_1 + 3x_2 + x_3 + x_4 &= 3 \\ 2x_1 - 2x_2 + x_3 + 2x_4 &= 8 \\ 3x_1 + x_2 + 2x_3 - x_4 &= -1 \end{aligned}$$

(a.) Write down the augmented matrix of this system.

(b.) Put the matrix from part (a.) into reduced row echelon form. DO NOT USE MATLAB

(c.) Find ALL of the solutions to this linear system.

(3.) Let $A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 5 & 7 \\ 2 & 4 & 6 \end{pmatrix}$ and $C = \begin{pmatrix} -1 & 2 \\ 1 & 4 \\ 3 & 6 \end{pmatrix}$. Find A^T, AC, AB, CA, $A+B$, $A+C$ if the expression is defined. DO NOT USE MATLAB

(4.) Let $A = \begin{pmatrix} 0 & 2 & 3 \\ 1 & 1 & 5 \\ 7 & 2 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 1 & 5 \\ 0 & 2 & 3 \\ 0 & 0 & -40 \end{pmatrix}$. Find three elementary matrices $\mathcal{E}_1, \mathcal{E}_2$ and $\mathcal{E}_3$ such that $\mathcal{E}_3\mathcal{E}_2\mathcal{E}_1 A = B$

(5.) Find the inverse of $\begin{pmatrix} -1 & -3 & -3 \\ 2 & 6 & 1 \\ 3 & 8 & 3 \end{pmatrix}$. DO NOT USE MATLAB

(6.) Find the $L-U$ factorization of $\begin{pmatrix} -2 & 1 & 2 \\ 4 & 1 & -2 \\ -6 & -3 & 4 \end{pmatrix}$. DO NOT USE MATLAB