Math 104 – Mathematics for Business and Economics II *07 March 2008*

QUIZ I

Duration 30 minutes

Name		***Student No***	
Surname		***Group***	

For the following questions ***show all your work clearly*** to find the answer.

Question 1. (*15 pts.*) Given the matrices $A=\begin{pmatrix} 2 & 3 \\ 1 & -1 \end{pmatrix}, B=\begin{pmatrix} 1 & 0 & -1 \\ 2 & 3 & 1 \end{pmatrix}, C=\begin{pmatrix} 2 & 1 & 0 \\ 0 & -1 & 1 \\ 3 & 1 & 2 \end{pmatrix}$.

Perform the following matrix operations, if possible. If it is not possible to perform that operation, then explain briefly why?

a. $AB=\begin{pmatrix} 2 & 3 \\ 1 & -1 \end{pmatrix}\begin{pmatrix} 1 & 0 & -1 \\ 2 & 3 & 1 \end{pmatrix}=\begin{pmatrix} 8 & 9 & 1 \\ -1 & -3 & -2 \end{pmatrix}$

b. $AC=\begin{pmatrix} 2 & 3 \\ 1 & -1 \end{pmatrix}\begin{pmatrix} 2 & 1 & 0 \\ 0 & -1 & 1 \\ 3 & 1 & 2 \end{pmatrix}$ is not defined, because the number of columns of the matrix A is not same with the number of the rows of the matrix C.

c. $B+C=\begin{pmatrix} 1 & 0 & -1 \\ 2 & 3 & 1 \end{pmatrix}+\begin{pmatrix} 2 & 1 & 0 \\ 0 & -1 & 1 \\ 3 & 1 & 2 \end{pmatrix}$ is not defined, because the dimensions of the matrices B and C are not same.

d. $CB^T=\begin{pmatrix} 2 & 1 & 0 \\ 0 & -1 & 1 \\ 3 & 1 & 2 \end{pmatrix}\begin{pmatrix} 1 & 2 \\ 0 & 3 \\ -1 & 1 \end{pmatrix}=\begin{pmatrix} 2 & 7 \\ -1 & -2 \\ 1 & 11 \end{pmatrix}$

Question 2. (*15 pts.*) Solve the following for x using the Saruss Method.

$$\begin{vmatrix} 1 & 2 & 0 \\ -1 & 3 & 5 \\ 1 & 1 & x \end{vmatrix}=10$$

$$\left|\begin{array}{ccc|cc} 1 & 2 & 0 & 1 & 2 \\ -1 & 3 & 5 & -1 & 3 \\ 1 & 1 & x & 1 & 1 \end{array}\right. = 10$$

$P_3=0$

$S_1=0$ $S_2=5$ $S_3=-2x$ $P_1=3x$ $P_2=10$

$$3x+10-(5-2x)=10$$
$$5x+5=10$$
$$5x=5$$
$$x=1$$

Question 3. (*20 pts.*) Solve the following system using the Inverse Matrix Method.

$$2x_1 - x_2 = 1$$
$$-x_2 + 3x_1 = 3$$

The matrix form $Ax = B$ is $\begin{pmatrix} 2 & -1 \\ 3 & -1 \end{pmatrix}\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$.

$$|A| = \begin{vmatrix} 2 & -1 \\ 3 & -1 \end{vmatrix} = -2 + 3 = 1$$

$$A^{-1} = \frac{1}{|A|} A_j = \frac{1}{1}\begin{pmatrix} -1 & 1 \\ -3 & 2 \end{pmatrix} = \begin{pmatrix} -1 & 1 \\ -3 & 2 \end{pmatrix}$$

$$x = A^{-1}B = \begin{pmatrix} -1 & 1 \\ -3 & 2 \end{pmatrix}\begin{pmatrix} 1 \\ 3 \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$$

So, the solution is $x_1 = 2,\ \ x_2 = 3$.