Key

Birzeit University

Mathematics Department

Quiz#1

Math 234.

Student name: Section TR 11 , TR 12:30 , SMW 11 Student #

(Q1) Fill the blanks with True (T) or False (F)

F [ ] (1) If A;B are n X n matrices and AB = 0, then either A = 0 or B = 0

F [ ] (2) The product of two elementary matrices is an elementary matrix

T [ ] (3) The inverse of an elementary matrix is an elementary matrix of the same type

F [ ] (4) If A is an nx n matrix and Ax = b is consistent for some b , then A is nonsingular

T [ ] (5) If A is a symmetric nonsingular matrix, then A^{-1}. is also symmetric

T [ ] (6) If the coefficient matrix of the system Ax = 0 is singular, then the system has infinite number of solutions

T [ ] (7) A square matrix A is nonsingular iff its reduced row echelon form is the identity matrix

T [ ] (8) If A is a singular matrix, then A^T. is also singular.

F [ ] (9) If A;B are singular, then A + B is also singular.

T [ ] (10) Any two nx n nonsigular matrices are row equivalent.

T [ ] (11) A homogeneous linear system can have a nontrivial solution.

Question #3 Use Gauss Jordan reduction to solve the following system of linear equations

$$x_1 - x_2 + 3x_3 + 2x_4 = 1$$
$$-x_1 + x_2 - 2x_3 + x_4 = -2$$
$$2x_1 - 2x_2 + 7x_3 + 7x_4 = 1$$

$$\left[\begin{array}{cccc|c} 1 & -1 & 3 & 2 & 1 \\ -1 & 1 & -2 & 1 & -2 \\ 2 & -2 & 7 & 7 & 1 \end{array}\right] \cong \left[\begin{array}{cccc|c} 1 & -1 & 3 & 2 & 1 \\ 0 & 0 & 1 & 3 & -1 \\ 0 & 0 & 1 & 3 & -1 \end{array}\right]$$

$$\cong \left[\begin{array}{cccc|c} 1 & -1 & 0 & 2 & 4 \\ 0 & 0 & 1 & 3 & -1 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$$

Solution

$$X_1 = 4 + s - 2t$$
$$X_2 = s$$
$$X_3 = -1 - 3t$$
$$X_4 = t$$

$s, t \in \mathbb{R}$.

Question #2 If the matrix $A=\left[\begin{array}{ccc|c} 1 & 2 & -1 & 1 \\ 2 & 1 & -2 & 5 \\ 1 & -1 & a & b \end{array}\right]$ is the augmented matrix of some linear system.

Find the values of a; b that make the system

$$A = \left[\begin{array}{ccc|c} 1 & 2 & -1 & 1 \\ 2 & 1 & -2 & 5 \\ 1 & -1 & a & b \end{array}\right] \cong \left[\begin{array}{ccc|c} 1 & 2 & -1 & 1 \\ 0 & -3 & 0 & 3 \\ 0 & -3 & a+1 & b-1 \end{array}\right]$$

$$\cong \left[\begin{array}{ccc|c} 1 & 2 & -1 & 1 \\ 0 & -3 & 0 & 3 \\ 0 & 0 & a+1 & b-4 \end{array}\right]$$

(i) inconsistent. $a=-1, \ b \neq 4$

(ii) has a unique solution. $a \neq -1$

(iii) has infinitely many solutions. $a=-1, \ b=4$