King Fahd University of Petroleum & Minerals
Department of Mathematics & Statistics
Math-280, Term-151
Major Exam 1, Time Allowed: 2 hours

Name: **ID:**

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Question	Score	Total Mark
1		25
2		10
3		25
4		10
5		10
6		20
TOTAL		100

Name: **ID:**

Question 1: Suppose that M is the augmented matrix of the following linear system

$$\begin{aligned} x_1 + 2x_2 - 3x_3 + x_4 &= 1 \\ -x_1 - x_2 + 4x_3 - x_4 &= 6 \\ -2x_2 - 4x_2 + 7x_3 - x_4 &= 1 \end{aligned}$$

(a) Find the reduced echelon form of M.

(b) Use part (a) to find the solution set of the system.

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Question 2: Find all values of α such that the system

$$\begin{aligned} x_1 - \alpha x_2 &= 1 \\ -3x_1 + (\alpha^2+2)x_2 &= \alpha+1 \end{aligned}$$

has

(a) no solution,
(b) a unique solution,
(c) infinitely many solutions.

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Question 3: If $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix}$,

(a) Is A row equivalent to the identity matrix?

(b) Find the inverse of A if it exits.

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Question 4: Let A and B be symmetric $n \times n$ matrices. Prove that $AB = BA$ if and only if AB is also symmetric.

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Question 5: Let A be an $n \times n$ matrix and α a scalar. Show that $\det(\alpha A) = \alpha^n \det(A)$.

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Question 6: Let A and B be 3×3 matrices. If $\det(A)=7$ and $\det(B)=6$. Find

(a) $\det(AB)$,

(b) $\det(2B)$,

(c) $\det(A^{-1})$,

(d) $\det\left(\left(A^{T}\right)^{-1}\right)$.