King Fahd University of Petroleum & Minerals
Department of Mathematics and Statistics
MATH 280-01(Term 162)
Exam I
15 March 2017

NAME: .....

ID #: . . . . . .

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Question	points	Score
1	12	
2	12	
3	12	
4	14	
5	10	
6	12	
7	12	
8	16	
Total	100	

Q1. Let

$$A = \begin{bmatrix} 1 & 0 & 3 \\ 1 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}$$

Find A^{-1} and use it to solve the system

$$\begin{aligned} x_1 + 3x_3 &= -5 \\ x_1 + x_2 + 3x_3 &= 2 \\ x_2 + x_3 &= 5 \end{aligned}$$

Q2. Let

$$A = \begin{bmatrix} 1 & 2 & -3 \\ -1 & 1 & -1 \\ 0 & -2 & -3 \end{bmatrix}$$

Find the LU factorization of A and use it to find $det(A)$

Q3. Let A and B be 3×3 matrices with $det(A) = x$ and $det(B) = y$. Let E be a 3×3 elementary matrix of type I. Use properties of determinants to compute (Justify your steps):

(i) $det(5A)$

(ii) $det(A^{-1}B)$

(iii) $det(EAB^T)$

Q4. Let S be a subset of $\mathbb{R}^3$ such that

$$S = \{(x,\ y,\ z)^T |\ \ 2x - y + z = 0\}$$

Show that S is a subspace of $\mathbb{R}^3$

Q5. Let A and B be $n \times n$ symmetric matrices. Show that $G = AB + BA$ is symmetric.

Q6. Let A be a 3×3 skew symmetric matrix ($A^T = -A$). Show that A is singular.

Q7. Let A be a nonsingular matrix. Define the adjoint of A ($adjA$). Show how to use it to find A^{-1}

Q8. Show that if A is nonsingular then $adjA$ is nonsingular and

$$(adjA)^{-1} = det(A^{-1})A = adjA^{-1}$$