HACETTEPE UNIVERSITY

MAT 254 - Midterm Exam - May 18, 2020

Department of Computer Engineering

Student Name and Number:_____

Instructors: *Prof.Dr. Derya Keskin Tütüncü, Assoc.Prof.Dr. Sultan Eylem Toksoy*

Question#	1	2	3	4	Total
Question Value	25	25	25	25	100
Your Grade					

1. Determine the values of a for which the following system has

$$\begin{aligned} x_1 + 3x_2 - x_3 &= 2 \\ 2x_1 + 5x_2 + 3x_3 &= 4 \\ x_1 + 2x_2 + a^2 &= -a. \end{aligned}$$

a) no solution:

b) infinitely many solutions:

c) a unique solution:

2. Let $A = \begin{bmatrix} 4 & 2 & 0 & 1 & 6 \\ 2 & 3 & 1 & -1 & 2 \\ 0 & 2 & 0 & 2 & -1 \\ 0 & 0 & 0 & 5 & 0 \\ 1 & 1 & 0 & 3 & -2 \end{bmatrix}$. (a) $|A| =?$

(b) $|(-1)A| =?$

(c) If $A \xrightarrow{R_1 \leftrightarrow R_3} B \xrightarrow{-500R_3+R_1} C \xrightarrow{\frac{1}{3}R_2} D$, then $|D| =?$

(d) $|B^T D^{-1}| =?$

3. Let $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & 1 \\ 3 & 2 & 0 \end{bmatrix}$. Find A^{-1}.

4. Determine whether the followings are true or false.

a) A vector is any element of a vector space.

b) Let A and B be $n \times n$ matrices. If $\text{rank}(A) = n$ and $\text{rank}(B) = n$, then $\text{rank}(AB) = n^2$.

c) Let $W = \left\{ A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} : cb = 0 \right\}$. W is a subspace of $M_{2\times 2}$.

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