

Second Semester
(without calculators)
Sunday 1-6-1444

First Quiz
Time: 30 mins.
240 Math

King Saud University
College of Science
Math. Department

Name:

Univ. ID No.:

Q1: If $A = \begin{bmatrix} 2 & 3 \\ -1 & -1 \end{bmatrix}$, $B = [1 \ 1 \ 2]$, then find the following:

(a) A^{-1} (2 marks). (b) $\text{tr}(A)$ (1 mark). (c) A^2 (2 marks). (d) $B^T B$ (2 marks).

Q2: Let A be the augmented matrix of a linear system. Find the solution of this system. (3 marks)

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 1 & 3 & 3 & 4 \\ 1 & 2 & 4 & 4 \\ 2 & 4 & 6 & 8 \end{bmatrix}$$

Solution

Q1:

$$(a) A^{-1} = \frac{1}{-2+3} \begin{bmatrix} -1 & -3 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} -1 & -3 \\ 1 & 2 \end{bmatrix}$$

$$(b) \operatorname{tr}(A) = 2 - 1 = 1$$

$$(c) A^2 = AA = \begin{bmatrix} 2 & 3 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} 2 & 3 \\ -1 & -1 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ -1 & -2 \end{bmatrix}$$

$$(d) B^T B = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix} \begin{bmatrix} 1 & 1 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 1 & 2 \\ 2 & 2 & 4 \end{bmatrix}$$

Q2:

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 1 & 3 & 3 & 4 \\ 1 & 2 & 4 & 4 \\ 2 & 4 & 6 & 8 \end{bmatrix} \xrightarrow{\substack{(-1)R_{12} \\ (-1)R_{13} \\ (-2)R_{14}}} \begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$
$$\xrightarrow{(-2)R_{21}} \begin{bmatrix} 1 & 0 & 3 & 4 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \xrightarrow{(-3)R_{31}} \begin{bmatrix} 1 & 0 & 0 & 4 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\Rightarrow (x_1, x_2, x_3) = (4, 0, 0)$$