Third Semester	**First Quiz**	**King Saud University**
(without calculators)	**Time: 30 mins.**	**College of Science**
Tuesday 12-10-1444	**240 Math**	**Math. Department**
Name:	**Univ. ID No.:**	

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

(a) A^{-1} (2 marks). (b) 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)

$$A = \begin{bmatrix} 1 & 2 & 3 & 5 \\ 1 & 3 & 3 & 5 \\ 1 & 2 & 4 & 5 \\ 2 & 4 & 6 & 10 \end{bmatrix}$$

Solution

Q1:

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

(b) $tr(A)=1-1=0$

(c) $A^2=AA=\begin{bmatrix}1 & 3\\ -1 & -1\end{bmatrix}\begin{bmatrix}1 & 3\\ -1 & -1\end{bmatrix}=\begin{bmatrix}-2 & 0\\ 0 & -2\end{bmatrix}$

(d) $B^TB=\begin{bmatrix}1\\ 1\\ 1\end{bmatrix}\begin{bmatrix}1 & 1 & 1\end{bmatrix}=\begin{bmatrix}1 & 1 & 1\\ 1 & 1 & 1\\ 1 & 1 & 1\end{bmatrix}$

Q2:

$$A=\begin{bmatrix}1 & 2 & 3 & 5\\ 1 & 3 & 3 & 5\\ 1 & 2 & 4 & 5\\ 2 & 4 & 6 & 10\end{bmatrix}\xrightarrow[(-2)R_{14}]{\substack{(-1)R_{12}\\(-1)R_{13}}}\begin{bmatrix}1 & 2 & 3 & 5\\ 0 & 1 & 0 & 0\\ 0 & 0 & 1 & 0\\ 0 & 0 & 0 & 0\end{bmatrix}$$

$$\xrightarrow{(-2)R_{21}}\begin{bmatrix}1 & 0 & 3 & 5\\ 0 & 1 & 0 & 0\\ 0 & 0 & 1 & 0\\ 0 & 0 & 0 & 0\end{bmatrix}\xrightarrow{(-3)R_{31}}\begin{bmatrix}1 & 0 & 0 & 5\\ 0 & 1 & 0 & 0\\ 0 & 0 & 1 & 0\\ 0 & 0 & 0 & 0\end{bmatrix}$$

$$\Rightarrow (x_1,x_2,x_3)=(5,0,0)$$