

Second Semester

First Quiz

King Saud University

(without calculators)

Time: 20 mins.

College of Science

Thursday 27-7-1445

240 Math

Math. Department

Name:

ID no.:

Q1: If $A = \begin{bmatrix} 2 & 3 \\ -1 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 2 & 0 \end{bmatrix}$ and $p(x) = x^2 - 1$, then find the following:

(a) A^{-1} (1 mark).

(b) $\text{tr}(B^T B)$ (2 marks).

(c) $p(A)$ (2 marks).

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)

$$tr(B^T B) = tr \left(\begin{bmatrix} 1 & 2 \\ 1 & 2 \\ 2 & 0 \end{bmatrix} \begin{bmatrix} 1 & 1 & 2 \\ 2 & 2 & 0 \end{bmatrix} \right) = tr \left(\begin{bmatrix} 5 & 5 & 2 \\ 5 & 5 & 2 \\ 2 & 2 & 4 \end{bmatrix} \right) = 5 + 5 + 4 = 14$$

(c)

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