Quiz N°2 Math 302_122 (February 25, 2013)

KFUPM **Semester 122**

Dept. Math. &Stat. **A.Y:2012/2013**

Name: .....

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Exercise 1

Determine the inverse A^{-1} of

$$A = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}.$$

Exercise 2

Let

$$A = \begin{bmatrix} 1/2 & 1/2 & 0 \\ 1/4 & 1/4 & 1/2 \\ 1/4 & 1/4 & 1/2 \end{bmatrix}.$$

(a) Verify that $\det(\lambda I_3 - A)$, the characteristic polynomial of A, is given by

$$(\lambda - 1)\lambda(\lambda - \frac{1}{4}).$$

(b) Find a non–singular matrix P such that $P^{-1}AP = \operatorname{diag}(1, 0, \frac{1}{4})$.

(c) Prove that

$$A^n = \frac{1}{3}\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix} + \frac{1}{3 \cdot 4^n}\begin{bmatrix} 2 & 2 & -4 \\ -1 & -1 & 2 \\ -1 & -1 & 2 \end{bmatrix}$$

if $n \geq 1$.

Exercise 3

Let A be the symmetric matrix

$$A = \begin{bmatrix} 12 & -6 \\ -6 & 7 \end{bmatrix}.$$

Find a proper orthogonal matrix P such that P^tAP is diagonal.