مدونة المناهج السعودية

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الموقع التعليمي لجميع المراحل الدراسية

في المملكة العربية السعودية

TAIBAH UNIVERSITY
COLLEGE OF SCIENCE
MATHEMATICS DEPARTMENT

HOMEWORK 2

Course : Linear Algebra 1 (MATH 243)
Due Date : 05/12/2018

Name : ....

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Exercises	Marks
Ex. 1	
Ex. 2	
Ex. 3	
Ex. 4	
Ex. 5	
Ex. 6	

TOTAL

Exercise 1

10 Marks

(1) Let $A = \begin{pmatrix} 1 & 1 & 2 & -5 \\ 2 & 5 & -1 & -9 \\ 2 & 1 & -1 & 3 \\ 1 & -3 & 2 & 7 \end{pmatrix}$

(i) Evaluate $\det A$ and $\det A^T$

(ii) Is A a singular matrix?

Exercise 2

20 Marks

Let $A = \begin{pmatrix} 1 & 2 & -1 \\ 2 & 1 & 3 \\ 0 & 3 & -2 \end{pmatrix}$

(1) Find the adj(A) and A^{-1}.

(2) Evaluate : $\det\left(4(2(3A^2)^T)^{-1}\right)$

(3) Solve the following linear system :

$$\begin{cases} x + 2y - z &= 1 \\ 2x + y + 3z &= 2 \\ 3y - 2z &= 3 \end{cases}$$

- **(i)** by using A^{-1}.
- **(ii)** by using Cramar's rule.

Exercise 3

20 Marks

Let $A = \begin{pmatrix} -3 & 5 & 6 \\ -1 & 2 & 2 \\ 1 & -1 & -1 \end{pmatrix}$

(1) Compute $\det(A)$.

(2) Find the adjoint of A.

(3) Find the inverse of A .

(4) Using A^{-1} to solve the following linear system :

$$\begin{cases} -3x + 5y + 6z & = 2 \\ -x + 2y + 2z & = 0 \\ x - y - z & = 2 \end{cases}$$

(5) Find A^T and $(A^T)^{-1}$.

(6) Using the question (5) to solve the following linear system

$$\begin{cases} -3x - 1y + z & = 1 \\ 5x + 2y - z & = -1 \\ 6x + 2y - z & = 2 \end{cases}$$

Exercise 4

20 Marks

(1) Show that $v_1 = (-3, 5, 6)$, $v_2 = (-1, 2, 2)$, and $v_3 = (1, -1, -1)$ form a basis for $\mathbb{R}^3$.

(2) Give the coordinates of the vector $v = (3, 0, 3)$ relative to the basis $\mathcal{B} = \{v_1, v_2, v_3\}$ of $\mathbb{R}^3$.

Exercise 5

10 Marks

Let

$$V = \{(x, y, z) \in \mathbb{R}^3 \quad | \quad 2x - 3y = 0\}.$$

(1) Show that V is a vector subspace of $\mathbb{R}^3$.

(2) Give a basis for V.

(3) Find $\dim V$ the dimension of V.

Exercise 6

20 Marks

Consider in $\mathbf{P}_2$ the following polynomials:

$$\mathbf{p}_1 = 2, \qquad \mathbf{p}_2 = 1 + x^2, \qquad \text{and} \qquad \mathbf{p}_3 = 1 - x$$

(1) Show that the set $B = \{\mathbf{p}_1, \mathbf{p}_2, \mathbf{p}_3\}$ form a basis for $\mathbf{P}_2$.

(2) Let $\mathbf{q} = x^2 - 4$. Find $(\mathbf{q})_B$; the coordinates vector of $\mathbf{q}$ relative to the basis B.

(3) Let $\mathbf{B}_2 = \{\mathbf{e}_1, \mathbf{e}_2, \mathbf{e}_3\}$ be the standard basis of $\mathbf{P}_2$, where

$$\mathbf{q}_1 = -2, \qquad \mathbf{q}_2 = 1 - x^2 \qquad \text{and} \qquad \mathbf{q}_3 = 1 + x.$$

Compute $\mathbf{P}_{\mathbf{B}_2 \longrightarrow \mathbf{B}_1}$ the transition matrix from the standard basis $\mathbf{B}_2$ of $\mathbf{P}_2$ to the basis $\mathbf{B}_1$.