



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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| Name : | | |
| Name : | | |
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| Exercises | Marks | |
| Exercises Ex. 1 | Marks | TOTAL |
| | Marks | TOTAL |
| Ex. 1 | Marks | TOTAL |
| Ex. 1 | Marks | TOTAL |
| Ex. 1 Ex. 2 Ex. 3 | Marks | TOTAL |

| | / 1 | 1 | 2 | -5 | |
|---------------|---------------|----|----|----|--|
| (1) I at 4 | 2 | 5 | -1 | -9 | |
| (1) Let $A =$ | 2 | 1 | -1 | 3 | |
| (1) Let $A =$ | $\setminus 1$ | -3 | 2 | 7 | |

- (i) Evaluate $\det A$ and $\det A^T$
- (ii) Is A a singular matrix?

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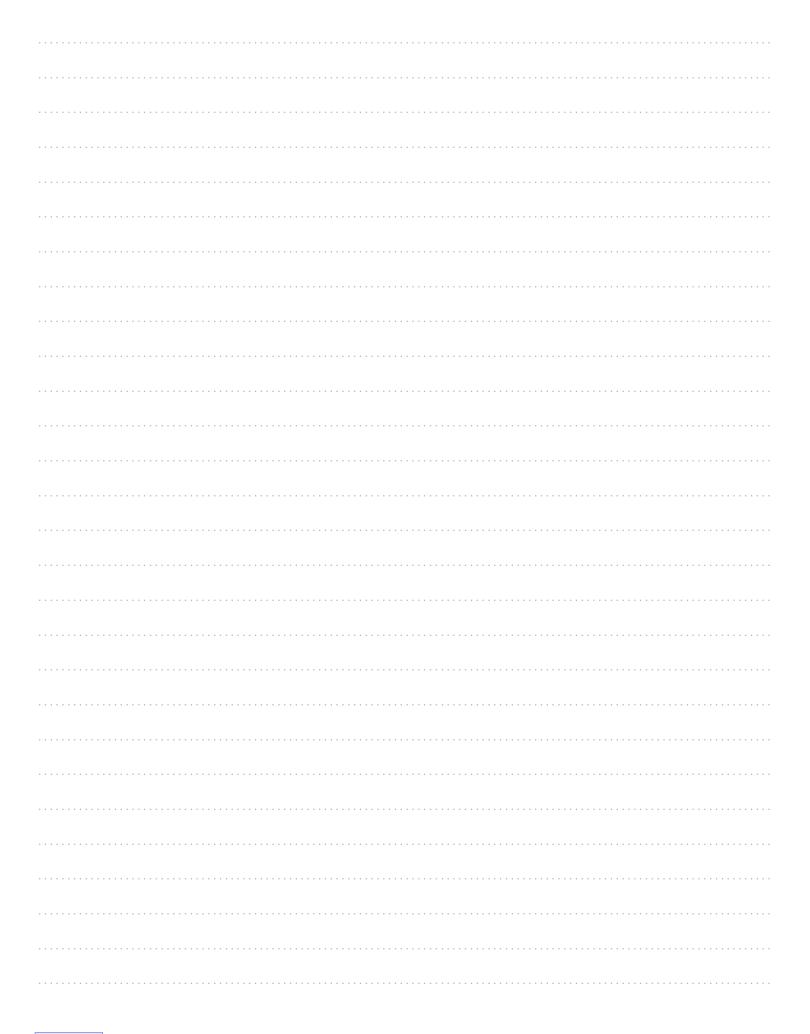
Let
$$A = \begin{pmatrix} 1 & 2 & -1 \\ 2 & 1 & 3 \\ 0 & 3 & -2 \end{pmatrix}$$

- (1) Find the adj(A) and A^{-1} .
- (2) Evaluate : $\det (4(2(3A^2)^T)^{-1})$
- (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.

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

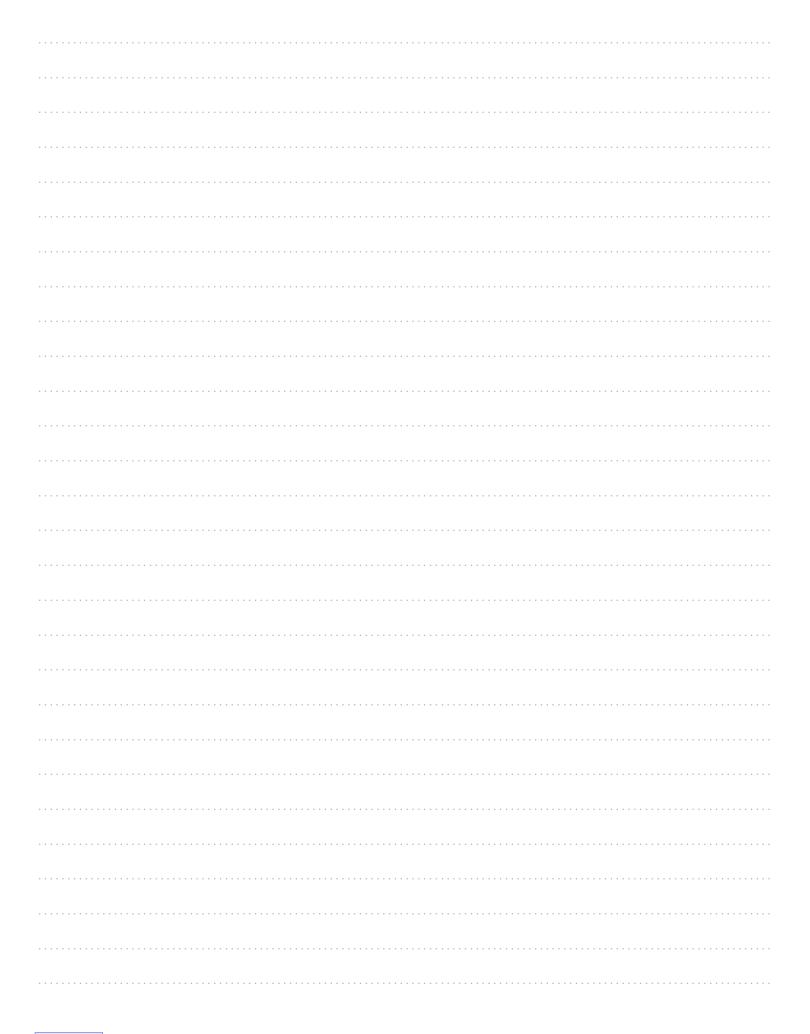
- (1) Compute det(A).
- (2) Find the adjoint of A.
- (3) Find the inverse of A.
- (4) Using A^{-1} to solve the following linear system :

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

- **(5)** Find A^T and $(A^T)^{-1}$.
- (6) Using the question (5) to solve the following linear system

$$\left\{ \begin{array}{ll} -3x - 1y + z & = 1 \\ 5x + 2y - z & = -1 \\ 6x + 2y - z & = 2 \end{array} \right.$$

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| Exercise 4 | 20 Marks |
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| Exercise 4 (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 . | 20 Marks |
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Let

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

| (1) Show that V is a vector subspace of R³. (2) Give a basis for V. | |
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| (3) Find dim V the dimension of V . | |
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Consider in \mathbf{P}_2 the following polynomials:

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

- (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

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

| 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 . |
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