# KABARAK UNIVERSITY

## EXAMINATIONS

## 2008/2009 ACADEMIC YEAR

## FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

**COURSE CODE:** **MATH 211**

**COURSE TITLE:** **LINEAR ALGEBRA I**

**STREAM:** **Y2S2**

**DAY:** **MONDAY**

**TIME:** **9.00 – 11.00 A.M.**

**DATE:** **10/08/2009**

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**INSTRUCTIONS:**

1. Answer question **ONE** and any other **TWO** questions
2. Begin each question on a separate page
3. Show your workings clearly

**PLEASE TURN OVER**

## QUESTION ONE (30 MARKS)

a) Solve the following system of equation by row-reduction

$2x + y = 3$

$x - 4y = -7$ (8 marks)

b) Given the matrices $A=\begin{bmatrix} 0 & 9 \\ 2 & -3 \\ -1 & 1 \end{bmatrix}$ $B=\begin{bmatrix} 8 & 1 \\ -7 & 0 \\ 4 & -1 \end{bmatrix}$ $C=\begin{bmatrix} 2 & 3 \\ -2 & 5 \\ 10 & -6 \end{bmatrix}$

Compute $3A + 2B - 1/2C$ (5 marks)

c) Determine the angle between the following vectors

i) **a** = (9,-2) and **b** = (4,18) (5 marks)

ii) u = (3,-1,6) v = ( 4,2,0) (5 marks)

d) Determine if the given set is a subspace of the given vector space

i) Let W be the set of all points, (x, y), from $R^2$ in which $x \geq 0$. Is this a subspace of $R^2$ (3 marks)

ii) Let W be the set of all points, $(0, x_1, x_2)$, from $R^3$ in which $x \geq 0$. Is this a subspace of $R^3$ (4 marks)

## QUESTION TWO (20 MARKS)

a) Compute the inverse of the following matrix using the determinant method

$$A = \begin{bmatrix} 4 & 2 & 1 \\ -2 & -6 & 3 \\ -7 & 5 & 0 \end{bmatrix}$$ (15 marks)

b) Compute the norms of the given vectors

i) V = (-5,3,9) (3 marks)

ii) J = (0,1,0) (2 marks)

## QUESTION THREE (20 MARKS)

a) Suppose that the set V is the set of positive real numbers(i.e $x > 0$) with addition and scalar multiplication defined as follows, $x + y = xy$ and $cx = x^c$

Show that this set under this addition and scalar multiplication is a vector space. (14 marks)

b) For the following matrices perform the indicated operation, if possible

$$A=\begin{bmatrix} 2 & 0 & -3 & 2 \\ -1 & 8 & 10 & -5 \end{bmatrix} \quad B=\begin{bmatrix} 0 & -4 & -7 & 2 \\ 12 & 3 & 7 & 9 \end{bmatrix}$$

i) A + B (3 marks)

ii) B - A (3 marks)

## QUESTION FOUR (20 MARKS)

a) Use Gaussian Elimination and Gauss-Jordan Elimination to solve the following system of linear equations.

$$-2x_1 + x_2 - x_3 = 4$$
$$x_1 + 2x_2 + 3x_3 = 13$$
$$3x_1 + x_3 = -1$$

(12 marks)

b) Determine if each of the following sets of vectors are linearly independent or linearly dependent

i) $v_1 = (3,1)$ and $v_2 = (-2,2)$ (4 marks)

ii) $v_1 = (12,-8)$ and $v_2 = (-9,6)$ (4 marks)

## QUESTION FIVE (20 MARKS)

a) Solve the following system of equation using cramer's rule

$$-2x_1 + x_2 - x_3 = 4$$
$$x_1 + 2x_2 + 3x_3 = 13$$
$$3x_1 + x_3 = -1$$

(10 marks)

b) Determine a basis and dimension for the null space of

$$A=\begin{bmatrix} 7 & 2 & -2 & -4 & 3 \\ -3 & -3 & 0 & 2 & 1 \\ 4 & -1 & -8 & 0 & 20 \end{bmatrix}$$

(10 marks)