KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2009/2010 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: MATH 211

COURSE TITLE: LINEAR ALGEBRA I

STREAM: SESSION I

DAY: THURSDAY

TIME: 2.00 – 4.00 P.M.

DATE: 26/11/2009

INSTRUCTIONS:

1. Answer question **ONE** and any other **TWO** questions
2. Begin each question on a separate page
3. Show your working 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) (5marks)

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 multication 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.

$-2x_1 + x_2 - x_3 = 4$

$x_1 + 2x_2 + 3x_3 = 13$ (12 marks)

$3x_1 + x_3 = -1$

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

$-2x_1+x_2-x_3=4$

$x_1+2x_2+3x_3=13$ (10 marks)

$3x_1 + x_3 = -1$

c) 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)