#### Kingdom of Saudi Arabia

Ministry of Higher Education

#### Al-Imam Mohammed Ibn Saud Islamic University

- College of Science -

Semester/Year: 2/35-36

Duration: 75mins



المَملَكَة العَربية السَّعُودِية وزَارَة التَّعلِيمِ العَـــالِي جَامِعَة الإِمَامِ مُحَمَّد بن سَعُود الإِسلَامِية -كلِّيــة العُـــلوم-

Course: Linear Algebra & Diff. Eqs

Course code: Math 227

# MidTerm 2

### Question 1 (2+3=5 marks)

Consider the vectors u = (1, 1, 2), v = (2, -2, 7) and w = (3, 4, 5) in  $\mathbb{R}^3$ .

- a) Determine the angle  $\theta$  between u and v.
- b) Determine whether u, v and w form a basis for  $\mathbb{R}^3$ .

### Question 2 (1+2=3 marks)

a) Determine whether the following polynomials form a basis for the vector space  $\mathbb{P}_2$  of polynomials of degree at most 2:

$$f(x) = 1$$
,  $g(x) = x$ ,  $h(x) = x^2$ , and  $k(x) = 1 + x + x^2$ .

b) Determine whether the set  $U = \{(a, b) \in \mathbb{R}^2 \mid ab = 0\}$  is subspace of  $\mathbb{R}^2$ .

### Question 3 (3+2=5 marks)

Let  $U = \{(a, b, c) \mid a + 2b - c = 0\}$  be a subset of  $\mathbb{R}^3$ .

- a) Show that U is a subspace of  $\mathbb{R}^3$ .
- b) Find a basis for U.

## Question 4 (2+3+2=7 marks)

Consider the following matrix  $A = \begin{bmatrix} 3 & 2 & 4 \\ 2 & 0 & 2 \\ 4 & 2 & 3 \end{bmatrix}$ .

- a) Show that 8 is an eigenvalue of A.
- b) Determine all the eigenvalues of the A.
- c) Determine the eigenvectors corresponding to the eigenvalue 8.

GOOD LUCK