Prince Sultan University

Department of Mathematics and Physical Sciences

Math 223

Second Midterm Examination

Semester I, Term 101

Saturday, January 1, 2011

Time Allowed: 100 minutes

Name:

Student Number:

Important Instructions:

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is seen or heard.
6. Looking around or making an attempt to cheat will result in your exam being cancelled.
7. This examination has 9 problems, some with several parts. Make sure your paper has all these problems.

Problems	**Max points**	**Student's Points**
1,2,3,4	21	
5,6	16	
7,8,9	22	
9	15	
Total	**74**	

HAPPY NEW YEAR

Question.1 (5 points)
Find the area of the parallelogram determined by **u**= $(1,-1,2)$ and **v**= $(0,3,1)$.

Question.2 (5 points)
Let **v**= $(4,7,-3,2)$ and **w**= $(5,-2,8,1)$. Find the vector x that satisfies $5x-2v=2(w-5x)$.

Question.3 (3 points)
Explain why the vectors **u**=(1,2,4) ans **v**=(5,10,20) are linearly dependent in R^3 .

Question4 (8 points)
Let u= (u_1,u_2,u_3) and v= (v_1,v_2,v_3). Determine whether $\langle u,v\rangle = u_1v_1+u_3v_3$ is inner product on R^3 . Explain your answer.

Question.5 (8 points)

a) Find parametric equation of the line passing through the points $(5,-2,4)$ and $(7,2,-4)$.

b) Where does the line intersect the xy plane.

Question.6 (8 points)

Check whether the set of all 2×2 matrices of the form $\begin{bmatrix} a & a+b \\ a+b & b \end{bmatrix}$ is a vector space with matrix addition and scalar multiplication.

Question.7 (7 points)

Determine whether the vectors $v_1 = (2,2,2),\ v_2 = (0,0,3),\ v_3 = (0,1,1)$ span R^3.

Question.8 (6 points)

a) Find the length of the vectors $\mathbf{u}=(-1,5,2)$ ans $\mathbf{v}=(2,,-9)$.

b) Find the cosine of the angle between **u** and **v**.

Question.9 (9 points)

Show that the following set of vectors $\begin{bmatrix} 3 & 6 \\ 3 & -6 \end{bmatrix}, \begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & -8 \\ -12 & -4 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$, is a basis for M_{22}.

Question.10 (15 points)

Consider the linear operator $T: R^3 \rightarrow R^3$ defined by $\begin{cases} w_1 = x_1 - 2x_2 + 2x_3 \\ w_2 = 2x_1 + x_2 + x_3 \\ w_3 = x_1 + x_2 \end{cases}$.

a) Find the standard matrix for T.

b) Determine whether T is one to one.

c) Find the standard matrix for T^{-1}.

d) Find $T^{-1} = (w_1, w_2, w_3)$.