



Prince Sultan University
Department of Mathematics and Physical Sciences

Math 215
Second Midterm Exam
Semester I, Term 131
Thursday, December 23, 2013

Time Allowed: 80 minutes

Name:

Student Number:

Grading Policy:

Questions	Q.1	Q.2	Q.3	Q.4	Q.5	Q.6	Q.7	Total
Student's Mark								
Maximum Mark	4	5	5	7	4	6	9	40

Statement of Ethics:

I agree to complete this exam without unauthorized assistance from any person, materials, or device.

Signature:

Q.1 (4 points) Find $\left\| \text{proj}_{\vec{a}} \vec{u} \right\|$ if $\vec{u} = (3, -2, 6)$ and $\vec{a} = (1, 2, -7)$.

Q.2 (5 points) Find the volume of the parallelepiped with sides $\vec{u} = (3, 1, 2)$, $\vec{v} = (4, 5, 1)$, $\vec{w} = (1, 2, 4)$.

Q.3 (5 points) Find the equation of the plane that is perpendicular to the plane $8x - 2y + 6z = 1$ and passes through the points $(-1, 2, 5)$ and $(2, 1, 4)$.

Q.4 (7 points) Consider the linear operator $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ defined by the equations

$$\begin{cases} w_1 = x + 4y - z \\ w_2 = 2x + 7y + z \\ w_3 = x + 3y \end{cases}$$

- a) Determine whether T is one to one.
- b) If so, find the standard matrix for the inverse operator T^{-1} .
- c) Find $T^{-1}(w_1, w_2, w_3)$.

Q.5 (4 points) Show that the set of vectors $\{e^x, xe^x, x^2e^x\}$ is linearly independent.

Q.6 (6 points) Find the coordinate vector of $\vec{w} = (1,1)$ relative to the basis $S = \left\{ \vec{u}_1, \vec{u}_2 \right\}$ for R^2 where $\vec{u}_1 = (2,-4)$ and $\vec{u}_2 = (3,8)$.

Q.7 (9 points) Determine the dimension of and a basis for the solution space of the system

$$\begin{cases} x - 3y + z = 0 \\ 2x - 6y + 2z = 0 \\ 3x - 9y + 3z = 0 \end{cases}$$