King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Math 201-19 Class Test 2 Fall 2010(010)

ID#:_____ NAME:_____

Serial#_____ **(SHOW YOUR WORK)**

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(1) Describe and sketch the surfeces in space defined by the following equations:
. (15pts)

- (i) $z = -1$
- (ii) $x^2 + z^2 = 3$
- (iii) $z = y^2$
- (iv) $yz = 1$
- (v) $z = -y + 1$

(2) Let $\vec{a} = \langle \sqrt{2}, 1, 1 \rangle$ and $\vec{b} = \langle -\sqrt{2}, 4, -1 \rangle$ be two vectors in $\mathbb{R}^3$. (10pts)

- i) Find the scalar projection and vector projection of $\vec{b}$ onto $\vec{a}$.
- ii) Find the angle between the vectors $\vec{a}$ and $\vec{a} + \vec{b}$.
- iii) If $\vec{r} = \langle x, y, z \rangle$, show that the vector equation $(\vec{r} - \vec{a}).(\vec{r} - \vec{b}) = 0$ represents a sphere.

(3) (a) Find the angle that the vector $\mathbf{v} = -\sqrt{3}\mathbf{j} + \mathbf{k}$ makes with the positive y-axis.
. (2pts)

(b) Find all unit vectors parallel to the xz-plane that are perpendicular to the vector $2\mathbf{i} - 3\mathbf{j} - \mathbf{k}$. (5pts)

(c) If a vector has direction angles $\alpha = \pi/4$ and $\beta = \pi/3$, find the third direction angle γ. (3pts)

(4) (a) Let $\vec{a} = \vec{OP}$, where P is the point $(2, 2, \sqrt{2})$. Compute the vectors $\vec{b}$ and $\vec{c}$. (3pts)

(b) Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three vectors in the plane $3x - 5y + 6z = 7$. Compute

$$(-\vec{a} + 4\vec{b} - 7\vec{c}).(-3i + 5j - 6k). \qquad \text{(7pts)}$$

(5) Given the points $A(1,0,1)$, $B(2,3,0)$, $C(-1,1,4)$, and $D(0,3,2)$, find the volume of the parallelepiped with adjacent edges AB, AC, and AD. (10pts)