King Fahd University of Petroleum and Minerals
Department of Math & Stat

Math 201 (Calculus III) (071)
Major Examination I (Sections 2, 5, 14)
October 28, 2007

Time: 90 Minutes **Marks: ______/60**

Name: ______________________ Section #: __________

ID #: ______________ Serial #: __________

Instruction:

1. Show complete and neat work for full credit.
2. This exam consists of (9) pages.

1. Sketch the curve with parametric equations

$$x = \sin t, \quad y = \sin^2 t.$$

(Include all necessary details). (5 points)

2. Let $r^2 = 4\cos\theta$. Check symmetry of this curve about x-axis, y-axis and the origin. Show complete procedure to sketch this curve. (10 points)

3. Find area of the region that is inside the graph of $r = 3 + 2\sin\theta$ and outside the circle $r = 4$. (10 points)

4. For the curve $r = 2 + 2\cos\theta$, find points at which the tangent line is vertical.

(5 points)

5. Find area of: (10 points)

(a) curve $r^2 = 3\sin 2\theta$

(b) one petal of the rose $r = 3\cos 6\theta$.

6. (a) Describe the set of points in space whose coordinates satisfy

$$x^2 + y^2 + z^2 - 2x - 6y - 8z \leq -1.$$

(3 points)

(b) For $\vec{a} = \langle 3, -7, 2 \rangle$ and $\vec{b} = \langle 1, 0, -2 \rangle$, compute $\operatorname{proj}_{\vec{b}}\, \vec{a}$. (2 points)

7. Find distance between the lines:

$$L_1: \; x = 2 - t, \quad y = 2t, \quad z = 1 + t$$
$$L_2: \; x = 1 + 2t, \quad y = 3 - 4t, \quad z = 5 - 2t.$$

(5 points)

8. For the planes,

$$P_1: \quad -2x + 3y + 7z + 2 = 0$$
$$P_2: x + 2y - 3z + 5 = 0,$$

find (10 points)

(a) parametric equations of the line of intersection of P_1 and P_2,

(b) angle between P_1 and P_2.