

King Fahd University of Petroleum & Minerals

Department of Mathematical Sciences

Math 201(Calculus III)(051)

Major Examination I (Sec # 15)

October 11,2005

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

Name: _____**Serial #:** _____**ID#:** _____**Section #:** _____

(1) Show complete and neat work for full credit.

(2) This exam consists of (9) pages.

Q 1. Let $r = 5 \cos 2\theta$.

Check symmetry of this curve about x -axis, y -axis and the origin. Sketch this curve by giving necessary details.

(10 Points)

Q. 2 On the cardioid $r = 1 + \sin \theta$, find points where the tangent line is vertical.

(5 Points)

Q. 3 Find arc length of the cardioid $r = 3 + 3 \cos \theta$.

(5 Points)

Q. 4 Find area of the region that lies inside $r = 3 \sin \theta$ and outside $r = 1 + \sin \theta$

(10 Points)

Q.5 Find area of the surface generated by revolving the curve
 $x = 4\sqrt{t}$, $y = \frac{t^2}{2} + \frac{1}{t}$ ($1 \leq t \leq 4$) about the y -axis. (10 Points)

Q.6 (i) Plot the points $(3,4,-2)$ and $(2,-3,6)$ in three dimensional space.

(2 Points)

(ii) Sketch the surface $9x^2 + 4z^2 = 36$.

(2 Points)

(iii) Identify the surface $x^2 + y^2 + z^2 - 10y + 6z - 6x + 34 = 0$

(2 Points)

Q. 7. Let $\vec{a} = 3\vec{i} - 7\vec{j} + 2\vec{k}$, $\vec{b} = \vec{i} - 2\vec{k}$. Calculate $\frac{-3\vec{a}}{\|\vec{a}\|}$ and $\text{proj}_{\vec{b}} \vec{a}$

(4 Points)

Q. 8 (i) Show that $\|\vec{U} + \vec{V}\|^2 + \|\vec{U} - \vec{V}\|^2 = 2\|\vec{U}\|^2 + 2\|\vec{V}\|^2$. (5 Points)

(ii) Do the vectors

$$\vec{U} = \langle 1, -2, 1 \rangle$$

$$\vec{V} = \langle 3, 0, -2 \rangle$$

$$\vec{W} = \langle 5, -4, 0 \rangle$$

lie in the same plane? Justify.

(5 Points)