

King Fahd University of Petroleum & Minerals

Department of Mathematics & Statistics

MATH 201 – Calculus III

EXAM II

Semester 082

May 18, 2009

Duration: 100 minutes

Student Name : _____

ID Number : _____

Section Number : _____

Instructions

- Write neatly and eligibly. You may lose points for messy work.
- Show all your work.
- All types of calculators and mobiles are not allowed.

Question #	Student Grade	Maximum Points
Q.1		16
Q.2		17
Q.3		17
Q.4		17
Q.5		16
Q.6		17
TOTAL		100

- Q.1**
- i) Find the angle between the planes $x - 2y + z = 1$ and $2x + y + z = 1$.
 - ii) Find parametric equations for the line of intersection of these two planes.

- Q.2** a) Consider the quadric surface $4x^2 - 2y^2 + z^2 + 8 = 0$.
- Find the traces of the surface in the vertical planes $y = k$. (k is a constant)
 - Identify and sketch the surface.

- b) The cylindrical coordinates of a point are $(\sqrt{6}, \pi/4, \sqrt{2})$. Find the rectangular and spherical coordinates of the point.

- Q.3** a) Let $f(x, y, z) = \sqrt{16 - x^2 - y^2 - z^2}$
- Find and describe the domain of f
 - Find the range of f

b) Let

$$f(x, y) = \begin{cases} \frac{3xy}{x^2 + xy + y^2}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0). \end{cases}$$

Check whether or not f is continuous at $(0, 0)$.

- Q.4** a) The equation $xy + xz^3 - 2yz = 5$ defines z as an implicit function of x and y . Find $\frac{\partial z}{\partial x}$ at the point $(3, 2, 1)$.

- b) Find the linearization of $f(x, y) = \sqrt{x^2 + y^2}$ at the point $(4, 3)$

- Q.5**
- i) Find the directional derivative of the function $f(x, y) = \ln(x^2 + y^2)$ at the point $(1, 2)$ in the direction of $\vec{v} = \langle -1, 2 \rangle$
 - ii) Find the maximum rate of change of f at the point $(1, 2)$.

- Q.6** Find the absolute maximum and minimum values of $f(x, y) = 2 + 2x + 2y - x^2 - y^2$ on the closed triangular region in the first quadrant bounded by the lines $x = 0$, $y = 0$, $y = 9 - x$.

