King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
MATH 201- Calculus-III (041)
Major Examination II (Sections 8 and 11)
December 4,2004

Time: 90 Minutes Grade: 60

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SHOW COMPLETE AND NEAT WORK FOR FULL CREDIT.

1. (i) Find equation of a plane whose points are equdistant from the points (4,-2,2) and (3,2,5).
   (ii) Find point of intersection of the plane $2x+3y-z=0$ and the line through (2,1,0) that is perpendicular to the plane.

(5+5)

2. (i) Identify and sketch the surface obtained by revolving the graph of $z^2-x^2=1$ about the x-axis.
   (ii) Describe curve of intersection between the surfaces $z=x^2+y^2$ and $z=8-x^2-y^2$.

(5+5)

3. Evaluate $\lim_{(x,y)\longrightarrow(0,0)}\left[\ \frac{x^2-y^2}{\sqrt{x^2+y^2}}+\frac{\sin h(4x^2+4y^2)}{x^2+y^2}\ \right]$ (5)

4. (i) Sketch the level surface for $f(x,y,z)=z-(x+3)^2-(y-2)^2+16$ when k=8.
   (ii) $f(x,y)=\begin{cases}\dfrac{2x^2y}{x^4+y^2} & (x,y)\neq(0,0)\\ \\ 0 & (x,y)=(0,0)\end{cases}$
   Check whether or not f is continuous at (0,0). (5+5)

5. Suppose that $\ln(2x^2+y-z^3+3w)=z$. use implicite differentiation to find $\frac{\partial w}{\partial z}$.

(5)

6. The function $f(x,y) = x^2y$ has a local linear approximation $L(x,y) = 4y - 4x + 8$ at a point $P_0(x_0, y_0)$. Find the point P_0.

(5)

7. Define $f : R^2 \longrightarrow R$ by

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

Show that $f_{xy}(0,0) \neq f_{yx}(0,0)$. (10)

8. Let $w = r^2 + sv + t^3$ where

$r = x^2 + y^2 + z^2, s = xyz, v = xe^y$ and $t = yz^2$.

Use chain rule to calculate $\dfrac{\partial w}{\partial z}$. (5)