MATH 2210-90 Fall 2011
Second Midterm Exam

INSTRUCTOR: H.-PING HUANG

LAST NAME _____

FIRST NAME _____

ID NO. _____

INSTRUCTION: SHOW ALL OF YOUR WORK. MAKE SURE YOUR ANSWERS ARE CLEAR AND LEGIBLE. USE **SPECIFIED** METHOD TO SOLVE THE QUESTION. IT IS NOT NECESSARY TO SIMPLIFY YOUR FINAL ANSWERS.

PROBLEM 1   20   _____

PROBLEM 2   20   _____

PROBLEM 3   20   _____

PROBLEM 4   20   _____

PROBLEM 5   20   _____

TOTAL   100   _____

PROBLEM 1

(20 pt) Find all the first and second order partial derivatives of
$$f(x, y) = -2\sin(2x + y) - 6\cos(x - y).$$

PROBLEM 2

(20 pt) If $w = x^2 + y^2 + z^2 + xy$, where $x = st$, $y = s - t$, $z = s + 2t$, find $\partial w / \partial s$.

PROBLEM 3

(20 pt) Find the extrema, if any, of the function defined by $F(x, y) = 3x^3 + y^2 - 9x + 4y$.

PROBLEM 4

(20 pt) If $T = e^{xy} - xy^2 - x^2yz$, what is the direction of the greatest **drop** of T at the point of $(0, -1, 2)$.

Bonus:
(5 pt) Find the directional derivative in that direction.
(5 pt) What is the equation of the tangent plane at $(0, -1, 2)$?

PROBLEM 5

(20 pt) Find all the **possible** extremal values for the function
$$f(x, y) = 4 + xy - x^2 - y^2$$
over the set $S = \{(x, y) \ : \ x^2 + y^2 \leq 1\}$.
Remark: Do not calculate the numerical values.