Name: _____ **PID:** _____

TA: _____ **Sec. No:** _____ **Sec. Time:** _____

Math 20C.
Midterm Exam 2
May 23, 2007

Turn off and put away your cell phone.
You may use any type of handheld calculator; no other devices are allowed on this exam.
You may use one page of notes, but no books or other assistance on this exam.
Read each question carefully, answer each question completely, and show all of your work.
Write your solutions clearly and legibly; no credit will be given for illegible solutions.
If any question is not clear, ask for clarification.

1. The tangent plane to a surface $z = f(x, y)$ at the point $(-2, 3, 4)$ has equation $4x + 2y + z = 2$. Estimate $f(-2.1, 3.1)$.

#	Points	Score
1	6	
2	6	
3	6	
4	6	
5	6	
Σ	30	

2. Let $f(x, y) = x^2 + 6y^2$.

(a) Find the unit vector in the direction for which the directional derivative of f at the point $(-3, 4)$ is maximum.

(b) Find the unit vectors in the directions for which the directional derivative of f at the point $(-3, 4)$ is zero.

(c) Compute the directional derivative of f at the point $(-3, 4)$ in the direction toward the origin.

3. Find the absolute maximum and minimum values of $f(x, y) = 4x - x^2 - y^2$ on the region $\mathcal{D} = \{(x, y) \mid x^2 + y^2 \leq 4\}$.

4. Use Lagrange multipliers to find the maximum and minimum values of $f(x, y) = xy$ subject to the constraint $x^2 + y^2 = 18$.

5. Evaluate $\iint_{\mathcal{D}} (2x+y)\, dA$, where $\mathcal{D}$ is the region bounded by $y = x$ and $y = 6x - x^2$.