Math 2043, Calculus III, Prof. Gutiérrez **Quiz 3, Due June 8, 2009**

NAME: ______________________________ **SECTION:**______

1. Let $f(x, y) = (x^2 + y)e^{x-y}$. Find the linearization of f at $(0, 0)$, and use it to find the approximate value of $f(0.1, 0.1)$.
2. Estimate $\sqrt{7.1^2 + 4.9^2 + 70.1}$ using the linear approximation.
3. The temperature at the point (x, y, z) in a room is given by $T(x, y, z) = e^{xyz+y^2}$. A fly is standing on a table on the plane $z = 3$ at the point $(1, 1, 3)$. Find the direction the fly should move in order to feel the maximum rate of increase in the temperature,
    1. if it flies;
    2. if it is just walking on the table.
4. Use the chain rule to find $\partial z/\partial s$ and $\partial z/\partial t$ where $z = \arctan(2x + y)$, $x = s^2t$ and $y = s \ln t$.
5. Use the chain rule to find $\partial R/\partial x$ and $\partial R/\partial y$ where $R = \ln(u^2 + v^2 + w^2)$, $u = x + 2y$, $v = 2x - y$, $w = 2xy$ when $x = y = 1$.
6. Find the directional derivative of $f(x, y) = x^2y^3 - y^4$ at the point $(2, 1)$ in the direction $\theta = \pi/4$.
7. Find the gradient of $f(x, y, z) = \sqrt{x + yz}$ at the point $(1, 3, 1)$.
8. Find the directional derivative of $f(x, y, z) = (x + 2y + 3z)^{3/2}$ at the point $(1, 1, 2)$ in the direction $v = 2\mathbf{j} - \mathbf{k}$.
9. The tangent plane to the surface $xyz = 1$ is parallel to the plane $2x + 4y + z = 2$ and contains the point $(-1, 1, a)$. Find the value of a.
10. Find the equation of the tangent plane to the surface given by $z = e^{x^2-y^3}$ at the point $(1, 1)$.