Math 280 B

THIRD HOUR EXAM

NAME_____

General Notes:

1. **Show work**.
2. Look over the test first, and then begin.
3. Calculators are not permitted on this exam. Carry out any calculations to the point at which you would need a calculator (for example, to take the square root of a number) and leave it in that form.

Friday, Nov. 13, 2009
90 pts. (will be normalized to 100 pts in the gradebook)

1. (15 pts.) Give a definition for the partial derivative of a function with respect to x, and then use the definition to calculate $\frac{\partial f}{\partial x}$ for $f(x, y) = x^2 + 2xy + y^2$

2. (15 pts.) Suppose that $w(x, y) = x^2 + 2y^2$ and that $x(t) = \cos(t)$ and $y(t) = \sin(t)$. Give the chain rule for calculating $\frac{dw}{dt}$ and then use that to calculate $\frac{dw}{dt}$ in this case.

3. (20 pts.) Let $f(x, y) = x^2 + 2xy + y^2$ (as in problem 1).

a. Calculate the gradient vector $\vec{\nabla} f$ of *f*.

b. At the point (1, 1), what is the **direction** of greatest increase in the function ?

c. At the point (1,1), what is the directional derivative of *f* in the direction $\vec{u} = \frac{3}{5}\vec{i} + \frac{4}{5}\vec{j}$

4. (10 pts.) Find the equation of the plane tangent to the surface $x^2 + 2xy + y^2 - z = 0$ at the point (1, 1, 4)

4. (20 pts.) Given $z = 2xy - 5x^2 - 2y^2 + 4x - 4$ find the local maximum or minimum (there should only be one) and use the second derivative test for functions of two variables to determine if it is a maximum or a minimum for z

5. (10 pts.) Calculate $\int_0^1 \int_0^1 4xy\,dx\,dy$