Name _____

MATH 221A Multivariate Calculus Spring 2002 Project #5

Instructions

You are encouraged to work with others on this project. As with all writing you should work out the details in draft form before writing a final solution. You should write your solution in paragraph form using complete sentences that incorporate all symbolic mathematical expressions into the grammatical structure. You should include enough detail so that a reader can follow your reasoning and reconstruct your work. You should not show every algebraic or arithmetic step. You should do your own writing of the solution even if you have worked out the details with other people. All graphs should be done carefully on graph paper or using appropriate technology. The project is due at the beginning of class on Tuesday, March 26.

The table on the back of this sheet gives the outputs $f(x, y)$ for a function $f : \mathbb{R}^2 \to \mathbb{R}$ for inputs (x, y) in $[0, 10] \times [0, 10]$. The numbers in gray cells along the top of the grid give values of x and the numbers in gray cells along the left edge give values of y. Numbers in the white region are the corresponding outputs.

1. Make a careful sketch of level curves for values of $z = f(x, y)$ from $z = 0$ to $z = 150$ with $\Delta z = 15$.

2. Estimate the inputs that correspond to any interesting features on the graph of the function f. Interesting features might include peaks, pits, and saddles.

3. Describe the graph of $f(x, y)$.

4. Estimate the partial derivatives $f_x(5.5, 4.0)$ and $f_y(5.5, 4.0)$.

5. Estimate the directional derivative at $(5.5, 4.0)$ in the direction of the origin.