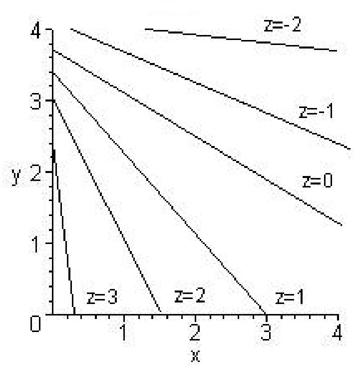
Math 303, Exam #2 **Name:** ______________________________

Fall 2002

Please write out the full pledge, and sign below.

1. The contour diagram for $f(x, y)$ is drawn below.



a. Approximate $f_x(1, 1)$.

b. Approximate $f_y(1, 1)$.

c. Sketch grad $f(1, 1)$ on the contour diagram.

d. Is $f_{xx}(1, 1)$ positive or negative?

2. Let $f(x, y) = 2x^2 - xy$, and $\vec{v} = 2\vec{\imath} - \vec{\jmath}$.

a. Compute $f_x(x, y)$.

b. Compute $f_y(x, y)$.

c. Compute $f_{xx}(x, y)$.

d. Compute $f_{xy}(x, y)$.

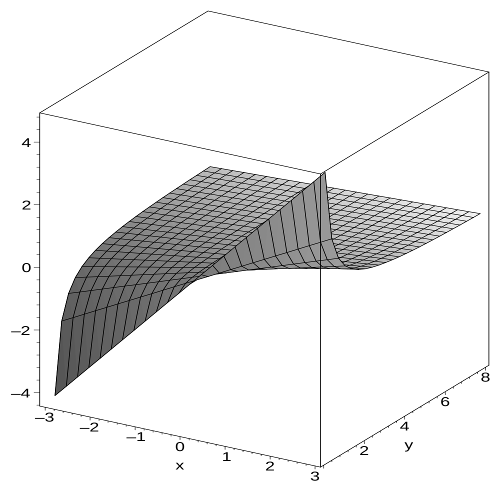
e. Compute the directional derivative of $f(x, y)$ in the direction of $\vec{v}$, at the point $(2, 0)$.

3. Compute the regression line (line of best fit) for the points $(0, 1)$, $(1, 3)$, $(3, 6)$. In order to receive full credit, you must use the methods discussed in this class, and show all your work.

4. Let $f(x, y, z) = 4yz - 2x - 2y$.

a. Compute grad $f(3, 2, 1)$.

b. The level curve for $f = 0$ is drawn below. Sketch grad $f(3, 2, 1)$ on the the graph.



5. Let $g(x, y) = 2\sqrt{xy}$, $x(u, v) = u - v$, $y(u, v) = u + v$. Use the chain rule to compute the partial derivative g_v. Give your answers in terms of u and v.

6. Let $H(x) = e^{xy} - x$.

a. Find the Taylor polynomial of degree 2 for H near $(-1, 0)$.

b. Use your answer to part **a** to approximate $H(-1.1, .2)$.

7. Let $p(x, y) = x^2 - 2xy - 3y^2$. Find all of the critical points. For each critical point decide if it is a local maximum, local minimum, saddle point or none of these.

8. Let $F(x, y) = x^4 - 2x^2y + 2y$. Find all of the critical points. For each critical point decide if it is a local maximum, local minimum, saddle point or none of these.

9. Use Lagrange multipliers to find the maximum and minimum values of $f(x, y) = xy^2$. subject to the constraint $g(x, y) = 3x - 4y \leq 5$.