Name:

Math 208, Section 3

Exam 2

Show all work. How you get your answer is just as important, if not more important, than the answer itself. If you think it, write it!

1. (20 pts.) If

$$f(x, y) = x^2y + 3xy - xy^3 \ ,$$

where

$$x = x(t) = t - \sqrt{t^2 + 3} \quad \text{and} \quad y = y(t) = t^2 + 1 \ ,$$

use the Chain rule to find $\dfrac{df}{dt}$ when $t = 1$.

2. (20 pts.) Find the local extrema of the function

$$f(x, y) = x^4 - 4xy + y^2 \ ,$$

and determine, for each, if it is a local max. local min, or saddle point.

3. (20 pts.) Find the maximum and minimum values of the function

$$f(x, y) = 2x^2 - y + y^2$$

subject to the constraint

$$g(x, y) = 4x^2 + y^2 \leq 4$$

4. (20 pts.) Evaluate the interated integral

$$\int_0^2 \int_x^2 x^2(y^4+1)^{1/3}\, dy\, dx$$

by rewriting the integral to reverse the order of integration.

(Note: the integral *cannot* be evaluated in the order given....)

5. (20 pts.) Find the integral of the function

$$f(x, y) = x^2yz$$

over the region lying under the graph of the function $z = x^2$ and over the region in the x-y plane with $x^2 + y^2 \leq 4$ and $y \geq 0$.

(see the figure) (Hint: this is probably most easily done $dz\ dy\ dx$).