Math 258 – Fourth Hour Exam – Spring, 2004 v1

Name ______________________________

Show your work. Partial credit will be given where appropriate. 16 points per problem
===

Use the following function for problems 1-2.

$f(x, y) = 7x^2 - 5xy + y^2 + x - y + 6$

1. a. Find $f(2,3)$

b. Find $\frac{\partial f}{\partial x}$

c. Find $\frac{\partial f}{\partial y}$

d. Find $\frac{\partial^2 f}{\partial x \partial y}$

2. Find all points *(x,y)* where *f(x,y)* has a possible relative maximum or minimum. Use the second-derivative test to determine the nature of *f(x,y)* at each of these points.

3. Public health officials in a northern state are concerned with the death rate in their state. Suppose that the officials have approximated the death rate during the winter months as a function $f(x, y, z)$ where *x* is the average daily temperature, *y* is the number of days of snow during the period and *z* is the number of available emergency medical workers.

a) Explain why you would expect $\frac{\partial f}{\partial x}$ to be negative .

b) Explain why you would expect $\frac{\partial f}{\partial y}$ to be positive.

c) Would you expect $\frac{\partial f}{\partial z}$ to be positive or negative? Why?

4. Approximate the area bounded by the graph of the function $f(x) = x^3$ and the x-axis between x = 3 and x = 4. Use a Riemann sum with 4 subintervals and use the right endpoints of the subintervals to approximate this area. Draw a picture of the graph of f(x). Shade the region whose area you computed in the Riemann sum.

5. Find:

a) $\int_0^4 \left(x^3 + 2\right) dx$

b) $\int \left[\frac{\sqrt{t}}{4} - 4(t-3)^2 \right] dt$

c) $\int e^{-x} dx$

6. Recall that the Cobb-Douglas production function is $f(x, y) = Cx^A y^{(1-A)}$ where f(x,y) is units of production, x is units of labor, y is units of capital and C and A are constants. Suppose for a particular production line, the Cobb-Douglas production function is $f(x, y) = 25(x)^{\frac{2}{3}}(y)^{\frac{1}{3}}$

a) Show that, if there are no units of labor available, production will be 0.

b) Suppose labor costs $50 per unit and capital costs $75 per unit. Write the cost function C(x,y) that shows the cost of production when x units of labor and y units of capital are used.

c) Use the technique of Lagrange multipliers to find the maximum level of production on this line when $1350 are available for labor and capital.

Extra Credit: **What's wrong with the Mariners?**

Bad pitching ______

Bad hitting ______

There's something wrong with the Mariners? ______

Who are the Mariners? ______