

## TAKE HOME EXAM II

MAT 217 · FALL 2008

You must show all work to get full credit.

**Problem 1.** Find the local maximum and minimum values and saddle

$$f(x, y) = x^3 + y^3 - 6x^2 - 18y^2 + 9x + 81y;$$

**Problem 2.** *Cost Minimization.* Suppose Green vehicles is under contract to produce and deliver (for a fixed price) 1 million units of hybrid electric cars during the next year. It employs capital ( $K$ ) and labor ( $L$ ). If the firm seeks to maximize profits while meeting the terms of the contract, its production decision can be characterized as a constrained cost minimization problem in which the firm chooses the least cost combination of  $K$  and  $L$  are necessary to produce 1 million units.

Its objective is then to minimize the cost function

$$C(K, L) = 16K + 243L$$

subject to the output constraint

$$Q_0 = f(K, L)$$

and

$$f(K, L) = 2L^{\frac{3}{4}}K^{\frac{1}{4}}$$

set  $Q_0 = 1$ , where  $Q_0$  equals 1 million units of hybrid electric car.  $f$  is the production function for the firm.

**Problem 3.** An investor has 20 thousand dollars to invest among 4 possible investments. Each investment must be in units of a thousand dollars. If the total 20 thousand is to be invested, how different investment strategies are possible?

**Problem 4.** The scores at Centerville High School on last year's mathematics SAT test were approximately normally distributed with mean 490 and standard deviation 140. What proportion of the scores were between 550 and 750?