University of Wisconsin-Madison
Department of Economics

Econ 703 — Prof. R. Deneckere

Fall 2003

Final Exam

1. Maximize the value of $\prod_{i=1}^{n} x_i^2$ subject to $\sum_{i=1}^{n} x_i^2 = c^2$, where c> 0. What is the maximum value of the objective function on the constraint set?

2. Let f ,g and h be functions from $\mathbf{R}^2 \to \mathbf{R}$ given by $f(x,y) = ax^3 + bx^2 + cx + d$, $g(x,y) = y-x^4$, and $h(x,y)= x^3-y$. Assuming that $a > 0$, $b< 0$, $c> 0$ and $d< 0$, find the maximum of f(x,y) subject to $g(x,y) \le 0$ and $h(x,y) \le 0$.

3. Determine whether or not the real-valued function f defined on the nonnegathive orthant of $\mathbf{R}^n$, given by the formula $f(x_1, x_2, \ldots, x_n) = (x_1^r + x_2^r + \ldots + x_n^r)^{1/r}$, is concave for all 0< r< 1. Prove your assertion.

4. Consider the problem of maximizing $x_1^2 x_2$ on the constraint set $2x_1^2 + x_2^2 = a$. Do the solutions C $x_1(a)$, $x_2(a)$, $\lambda(a)$ depend smoothly on the parameter a near a= 3? Defend your answer.