Econ 703   Prof. R. Deneckere
Fall 2002

Final Exam

m

1.   Let $f : \mathbb{R}^n \to \mathbb{R}$ be concave. Let A be an n x m matrix, and let $b \in \mathbb{R}^n$. Consider the function h: $\mathbb{R}^m \to \mathbb{R}$ defined by :

$$h(x) = f(Ax+b), \ x \in \mathbb{R}^m.$$

Is the function h concave? Why or why not?

2.   Let $f : \mathbb{R}^2 \to \mathbb{R}$ and $g : \mathbb{R}^2 \to \mathbb{R}$ be given by $f(x,y) = x^2 + y^2$ and $g(x,y) = xy$. Find the minimum of $f(x,y)$ subject to $g(x,y) \geq 16$.

3.   The following nonlinear program depends on the three parameters p, q and $r \in \mathbb{R}_+$:

$$\max_{\{x_1,x_2\}} px_1^2 + qx_1x_2, \ s.t. \ x_1^2 + rx_2^2 \leq 1, \ x_1 \geq 0, \ and \ x_2 \geq 0.$$

a) Does a solution exist? Why or why not?
b) Solve the problem.
c) Determine the sensitivity of the optimum value of the problem to the parameters.

4.   Consider the following nonlinear program :

$$\max_{x \in \mathbb{R}} x, \quad subject \ to \ x^2 \leq 0.$$

Does the corresponding Lagrangean have a saddlepoint? Why or why not?