Department of Agricultural & Applied Economics
Microeconomics Qualifying Exam

May 27, 2011
10:00 a.m. - 3:00 p.m.

1. The theory of consumer behavior gives us several theorems. Such as:

   a. Slutsky equation.
   b. Homogeneity condition.
   c. Symmetry condition.
   d. Engel aggregation condition for income elasticities.

For each theorem, you should complete the following tasks:

   (i) Specify algebraically what each theorem states.
   (ii) Explain in words what you think the algebra says.
   (iii) Discuss explicitly how important and what useful role each theorem plays in empirical analysis conducted by the applied economists when actually estimating demand functions.

2. Consider a price-taking firm that produces an output q using inputs z_1 and z_2 according to the production function $f(z_1, z_2) = \sqrt{\min\{\alpha_1 z_1, \alpha_2 z_2\}}$ where $\alpha_i > 0, i = 1,2$. Let p be the output price and w_1, w_2 denote input prices.

   a. Derive the cost function of this firm.
   b. Derive the profit function of this firm.
   c. Derive the firm's supply function q(p). What is the sufficient condition for q^* to be a maximum?
   d. Determine whether the technology of this firm displays increasing, constant, or decreasing returns to scale.
   e. Suppose that initially $\alpha_1 = \alpha_2 = 1$ and a new technology becomes available such that $\alpha_1 = 2$. What is the maximum amount that the producer is willing to pay for access to this technology?

3. Consider a pure exchange economy consisting of two-consumers (denoted A and B) and two goods (denoted x_1 and x_2). Preferences and initial endowments for each consumer are given by

   $U^A(x_1^A, x_2^A) = (x_1^A x_2^A)^2 \qquad (e_1^A, e_2^A) = (4,4)$

   $U^B(x_1^B, x_2^B) = \ln(x_1^B) + 2\ln(x_2^B) \qquad (e_1^B, e_2^B) = (1,6)$

   a. Solve for the set of Pareto-efficient allocations in this economy.
   b. Solve for the Walrasian equilibrium in this economy.
   c. Solve for the commodity allocations that would maximize social welfare under a Nietzschean social welfare function $W = max(U^A, U^B)$.
   d. Graph an Edgeworth box for this economy. Label indifference curves for each agent, initial endowments, the Walrasian equilibrium, the contract curve, and the core.

4. Assume two competing firms selling a homogeneous product. The market price, P, is determined by (inverse) market demand:

$$P = a - bQ, \text{ if } a > bQ, P = 0 \text{ otherwise,}$$

where $Q = (q_1 + q_2)$ is total output. The cost function for each firm is represented by:

$$C_i = c^0 q_i + d, \quad i = 1, 2.$$

If we let $a = 14$, $b = 1$, $c^0 = 2$, and $d = 5$, answer the following questions (show all work):

a. What are the Cournot reaction functions?
b. What are the Cournot equilibrium outputs, price(s), firm profits, consumer surplus, and deadweight loss?
c. If firm one is a leader and firm two a follower, what are the Stackelberg equilibrium outputs, price(s) , firm profits, consumer surplus, and deadweight loss?
d. If the two firms collude, what is the equilibrium total output, price, and total profit?

5. Assume that in an economy there is one private good, Q (that is rival and exclusive in consumption), and one public good, y (that is non-rival and non-exclusive in consumption).

a. Define what is meant by a rival, exclusive private good and give an example.
b. Define what is meant by a non-rival, non-exclusive public good and give an example.
c. Suppose the production possibilities curve for this economy is given by: $y^2 + Q^2 = 320{,}000$ and the economy has 100 households with identical preferences for the public and private goods given by: $U = x_j y, j = 1, 2, \ldots, 100$, where $Q = \sum_{j=1}^{100} x_j$.

Determine the optimal levels of Q and y.