Spring 2003

MICROECONOMIC THEORY COMPREHENSIVE EXAMINATION

Greene/M. Jones/Yang

Write legibly in blue or black ink, not pencil. Begin each question on a fresh page. Number the questions you are answering on the cover of each blue book.

SECTION A (Select 8 of 9. True or false, taking the time to explain why in detail.)

1. The more inelastic the supply of cooperating factors, the more inelastic the demand function of a firm for a factor.

2. If an individual prefers "going to Paris for sure" to "going to Rome for sure" then he must prefer "going to Paris for sure" to the lottery that will assign "probability 0.5 to visiting Paris and 0.5 to visiting Rome."

3. If the expenditure functions of consumers A and B satisfy $e^A(P,u) = e^B(P,2u) + 10$, then their observable market behaviors will be the same.

4. If a household receives its income by selling two different resources and it gets the vast majority of its income from the first, the elasticity of its supply of the second will generally be bigger.

5. If we interpret Marshall's law of demand to be that more will be bought and sold in competitive markets only at lower prices, then it cannot be violated.

6. Third degree price discrimination always leaves some consumers worse off and always leaves the sum total of consumer surpluses lower.

7. While monopoly causes no productive inefficiency, monopsony does.

8. When a perfectly competitive increasing cost industry is in long run equilibrium and demand increases in the new equilibrium, there must be more firms.

9. Shadow prices of commodities are always positive.

SECTION B (Answer 3 of 5. Short answers.)

10. "A constant per unit tax on the output of a monopolist must raise price by exactly one half of the tax." Explain when this statement is true and when not.

11. A risk-averse consumer has initial wealth of w but runs a risk of losing L dollars. The probability of the loss is p. It is possible, however, to buy insurance. One unit of insurance costs Π dollars and pays 1 dollar if the loss occurs. The only constraint imposed by the insurance company is that the number of insurance units taken out, q, will not exceed the limit of $q \leq L$.

a. Assuming q units of insurance are bought, find the wealth of the individual: (i) if there is no loss, (ii) if the loss occurs. What is, then, the expected wealth? Expected utility?
b. Suppose now that the price Π of one unit of insurance is *actuarially fair* in the sense of it being equal to the expected cost of insurance. That is, $\Pi = p$. show that the consumer *insures completely* (i.e., $q = L$).
c. Alternatively, show that if insurance is actuarially unfair (so that $\Pi > p$), then the consumer will not insure completely (i.e., $q < L$).
d. Why do insurance companies insist on a coverage limit of $q \leq L$?

12. Two editions (hard-cover and soft-cover) of a new book are to be published t years apart. Copyright arrangements stipulate that publications dates and prices will be determined and announced (by the publisher) in advance. There are two types of readers. Type I have a reservation price of \$40 and type II have a reservation price of \$20. At any given time, however, all readers are indifferent between hard-cover and soft-cover copies of the same book. Assuming equal numbers of both types of readers, answer the following questions:

a. Suppose the annual discount rate for the publisher (who faces negligible production cost) is 10% ($r = .1$). The annual discount rate for readers (who are less patient) is 30% ($R = .3$). Determine the profit maximizing prices of the two editions (p_h *and* p_s), and the optimal waiting period, t, between their publication dates. [Suggestion: use continuous compounding.]
b. Alternatively, suppose that the publisher and the readers have the same discount rate. How would you modify your answer to a.?

13. A consumer has a utility function given by $u(x_1, x_2) = \sqrt{x_1} + x_2$. The prices of the goods are p_1 and p_2, and his income is y.

a. State conditions for achieving an interior solution.
   For the rest of the problem, assume that the conditions in a. hold
b. Find his indirect utility function.
c. Find his expenditure function.
d. Find his Hicksian demand functions.
e. Verify the Slutsky equation on the effect $\dfrac{\partial x_2(p, y)}{\partial p_1}$.

14. A firm has two plants. One plant produces output according to the production function $x_1^a x_2^{1-a}$. The other plant has a production function $x_1^b x_2^{1-b}$. What is the cost function for this firm?

SECTION C (Answer 2 of 4. Longer answers.)

15.A principal hires an agent to work for him. The agent's utility function is $u(w,a) = \sqrt{w} - a$, where w stands for wage and a for effort. The agent can choose from two possible levels of effort: "high effort," which means a = 5, or "low effort," which means a = 0. The agent's reservation utility is 9. The conditional probability distribution of the principal's gross profits (S_i) is given by:

	S_1 = \$0	S_2= \$100	S_3 = \$400
A = 0	0.6	0.3	0.1
A = 5	0.1	0.3	0.6

Effort levels are NOT observable. So the agent's wage can only depend on gross profit, which is observable.

a. What is the optimal way to induce the agent to choose a = 0?
b. What is the optimal way to induce the agent to choose a = 5?
c. What is the optimal contract to offer to this agent?
d. Would the principal have been better off if effort levels were observable? Why?

16. A consumer in a three-good economy with wealth level $w > 0$ has demand functions for commodities 1 and 2 given by

$$x_1 = 100 - 5\frac{p_1}{p_3} + \beta\frac{p_2}{p_3} + \delta\frac{w}{p_3}$$

$$x_2 = a + \beta\frac{p_1}{p_3} + \gamma\frac{p_2}{p_3} + \delta\frac{w}{p_3}$$

where Greek letters are nonzero constants.

a. Indicate how to calculate the demand for good 3 (but do not actually do it).
b. Are the demand functions for goods 1 and 2 appropriately homogeneous?
c. Calculate the restrictions on the numerical values of α, β, γ, *and* σ implied by utility maximization.
d. Given your results in part c., for a fixed level of x_3, draw the consumer's indifference curve in x_1, x_2 the plane.

17. Suppose that market demand is $Q = 500 - 4^p$ and that there are two firms each with a marginal cost of 25 per unit. Assuming that they behave as Cournot quantity setters, what will be the equilibrium price and quantities? Why is this an equilibrium? What if the first acted as a follower and the second as a leader a la VonStackelberg? If a monopolist or a competitive industry serves the same market what would be quantity and price? Return to the Cournot model. Suppose 5 identical firms. What is producer and what is price? Suppose 4 acted as followers and one led. What would be the quantity supplied and price?

18. Consider the following simple economy:

a. There are two final commodities, good 1 and good 2.
b. Production functions of commodities are given by $y_1 = L_1$ and $y_2 = L_2^{1/\beta}$ $(\beta \geq 1)$. L_i is labor input for production of good i.
c. The supply of labor is fixed at $L^{\wedge} > 0$.
d. There is a single consumer with utility function $u(x_1, x_2) = \alpha_1 \log x_1 + \alpha_2 \log x_2$ $(\alpha_i > 0)$.

Please calculate the competitive equilibrium of the above economy and discuss its stability.