

**MICROECONOMIC THEORY COMPREHENSIVE EXAMINATION**

Yang /Greene/M. Jones/

Write legibly in blue or black ink, not pencil. Begin each question on a new page.

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

1. It is less likely that a monopsonistic cartel is able to sustain market power for any conceivable period of time than for a monopolistic cartel to do so.
2. Of necessity, if a monopolist's behavior involves a profit maximizing single price and he turns to a two-part tariff, consumers are made worse off.
3. If duopolists follow the Bertrand model, they must always charge prices that equal marginal cost.
4. If investors are risk averse, then increasing the expected value of a risky investment by raising it via increases in payoffs in all events by X% will stimulate investment more than by raising the expected value by the same % via changes in probabilities of good and bad outcomes.
5. The theorem that reasons that rational consumers will have income elasticities that seem to unify rests on fewer assumptions than the one that states that the negative of the share of income spent on a good is related to its own price elasticity and the elasticities of all other goods with respect to it.
6. No good can have a positively sloped demand curve for all price ranges.
7. Suppose that in competitive equilibrium demand for X is more elastic than the demand for Y and they both have the same constant marginal cost. Then establishing a monopoly right to sell X will be more welfare reducing than establishing a duopoly right to sell Y.
8. If richer people have few children, then children are an inferior good.
9. If for a cartel of n members, the average sales per customer is  $x_1$ , then for the same cartel of n members the profit maximizing cartel's goals will be enhanced if total sales are the same but the number of customer is  $x_2$  and  $x_2 > x_1$ .

**SECTION B** (Answer 3 of 4. Short answers.)

10. Douffelberry juice is a mild intoxicant, prized for facilitating conversation among university administrators, but not otherwise valued. The berry does not travel well, so it must be squeezed on the farm where it is grown. Baskets of berries are produced using ounces of seeds,  $S$ , and hours of labor,  $L$ , according to a production function

$B = \min\{S, L\}$ . Gallons of Juice,  $J$ , are made from baskets of berries and hours of labor according to the production function  $J = B^{2/3} L^{1/3}$ . Seeds cost  $r$  per ounce and labor costs  $w$  per hour. Derive the cost function for Douffelberry juice,  $c(J, r, w)$ .

11. A consumer consumes two goods, and his indirect utility function is given by  $v(p_1, p_2, m) = \ln a(1-a) + 2 \ln m - \ln(p_1 p_2)$ . Find this consumer's direct utility function.

12. Describe what an equilibrium in mixed strategies in a game theoretic situation means. Then discuss what you would expect that in actual games people could actually depart from the behaviors described.

13. The Hicksian substitution matrix is defined as

$$H(\mathbf{p}, u) = \begin{bmatrix} \frac{\partial h_1(\mathbf{p}, u)}{\partial p_1} & \dots & \frac{\partial h_1(\mathbf{p}, u)}{\partial p_n} \\ \vdots & \ddots & \vdots \\ \frac{\partial h_n(\mathbf{p}, u)}{\partial p_1} & \dots & \frac{\partial h_n(\mathbf{p}, u)}{\partial p_n} \end{bmatrix}$$

where  $h_i(p, u)$  is the Hicksian demand for good  $i$ . Show that for all  $(p, u)$ ,  $H(p, u) \cdot p = 0$ .

**SECTION C** (Answer 2 of 3. Longer answers.)

14. Consider a Cournot duopoly with an inverse demand function  $p = b - aQ$ ,  $b > 0$ ,  $a > 0$ ,  $Q = q_1 + q_2$  and the total cost function  $C_i(q_i) = cq_i + K_i$  ( $i=1,2$ ) where  $K_i > 0$  is incurred only if firm  $i$  enters this market.

Please examine properties of various possible equilibria depending upon  $K_i$  ( $i=1,2$ ).

15. Consider the following economy with two commodities,  $x$  and  $y$ . The two goods are produced separately with production functions  $x = a L_x$  ( $a > 0$ ) and  $y = b L_y^{1/2}$  ( $b > 0$ ). Here  $L_x$  and  $L_y$  are labor inputs. Total supply of labor  $L^* > 0$  is fixed. There is a single consumer with a utility function  $u(x, y) = \log x + \log y$ . All the wage income and the profits from productions go to the consumer.

(i) Find the production transformation and the marginal rate of transformation;

(ii) Obtain the marginal rate of substitution of the consumption;

(iii) Find the competitive equilibrium of this economy.

16. Consider an economy with two goods and  $N$  consumers. Each consumer is given four units of good 1 as an initial endowment. Good 2 is produced using good 1 according to the technology

$$y_2 = (z_1)^{1/2}, \quad z_1 \geq 0, \quad y_2 \geq 0.$$

The production of good 2 generates a negative externality affecting the consumers' utilities. And

$$U^i(x_1^i, x_2^i, y_2) = x_1^i + \log x_2^i - \frac{1}{2} \log y_2, \quad i = 1, 2, \dots, N.$$

Assume that consumer  $i$  considers externality  $y_2$  as a parameter, that is, he neglects the impact of his own consumption of good 2 on the production of good 2.

(i) Assuming that each consumer receives  $1/N$  of the profits of the firm producing good 2 from good 1, determine the competitive equilibrium in this private property economy.

(ii) Explain why the competitive equilibrium is not Pareto optimal.

Spring 2004

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Write legibly in blue or black ink, not pencil. Begin each question on a new 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. Suppose that families are made of X's and Y's. If the X's contribute a bigger share to the family income and have zero elasticities of labor supply, then the elasticity of the supply of the Y's is likely to be positive.
2. A risk loving person will never buy insurance.
3. The consumer's surplus is a precise measurement for welfare change.
4. The price elasticity of demand for the average teenager who drinks six beers a week at current prices is likely to be stronger than that for the average adult who drinks six beers a week.
5. In a repeated prisoner dilemma game where two parties know they will play  $n$  times, the defecting strategy will be dominate and empirical evidence bears this out.
6. If an industry is monopolistically competitive, there will be too many varieties of the product supplied.
7. A consumer with continuous preferences will always have continuous Marshallian demand functions.
8. The revenue loss from a government established monopoly with constant marginal and average cost and a linear demand curve is triangular.
9. Because of the Walras Law, we can place the price vector on a simplex in general equilibrium analysis.

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

10. Suppose that all product markets are competitive and undistorted by any “market failures”. Explain what kinds of inefficiencies are created if one and only one of the suppliers in one market has monopolistic power. Do so using both partial and general equilibrium analysis.

11. A consumer's utility function is given by  $u(x_1, x_2, x_3) = x_1 + \min\{x_1, x_2\}$ . Prices of the goods are  $p_1, p_2$  and  $p_3$ , and income is  $m$ .

- (a) What are the Marshallian and Hicksian demand functions?
- (b) What is the expenditure function?
- (c) What is the indirect utility function?
- (d) Does the Slutsky equation hold for this consumer? Show.

12. Suppose that the government sold a limited number of rights to emit sulfur dioxide into the atmosphere. What kinds of economic arguments can be used to the effect that depending on the number sold that this might not be welfare enhancing but will get the emissions reduced at least cost?

13. Let  $x_i(p, y)$  be a consumer's Marshallian demand for good  $i$ . Let  $\eta_i$  be the income

elasticity of demand for good  $i$ , i.e.,  $\eta_i \equiv \frac{\partial x_i(p, y)}{\partial y} \frac{y}{x_i(p, y)}$ , and let  $s_i$  be the income

share of good  $i$ , i.e.,  $s_i \equiv \frac{p_i x_i(p, y)}{y}$ . Prove:  $\sum_{i=1}^n s_i \eta_i = 1$

14. Suppose there are two goods  $x$  and  $y$  and they are both public goods. There are two individuals whose entire consumption is made up of these two goods. There is production possibilities frontier given by  $g(x, y) = 0$ . Find the marginal conditions for production levels of  $x$  and  $y$  that satisfy the Pareto conditions.

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

15. Suppose a consumer has a utility function of the form  $U = \log Y$  where  $Y$  is income and his current income is 100. Suppose that there is a risky investment that can be made that has two possible outcomes leaving him with either 200 or 50 in income. The probability of the first is  $\frac{3}{4}$  and of the second is  $\frac{1}{4}$ .

- (i) Does he make the investment?
- (ii) At what probability of the second event is he indifferent between investing or not?
- (iii) Does his expected utility fall more if the winnings are taxed at 50% or if the probability of the win falls to 50%?
- (iv) Can you reach any generalized conclusions about the power of choices that reduce expected payoffs by the same amount but differ in, alternatively, probabilities or payoffs to change behaviors.

16. Two farmers, A and B, live 8 and 12 miles, respectively, from a river and are separated by 15 miles along the river. Pumphouses cost  $P$  dollars each and must be located on the river. Laying pipe costs \$100 per mile. Once the pipe is laid and pumphouses installed, the water is available at no extra cost.

(i) Do farmers have an incentive to minimize the total (to both farmers) cost of obtaining water?

(ii) If one pumphouse is used to supply both farmers, show that it will be located 6 miles from the point on the river closest to farm A. What will the cost of water be for each farmer and totally in terms of  $P$ ?

(iii) Suppose the farmers build their own pumps. What will the cost to each be and the total cost?

17. Consider the following economy with a worker and a landlord. Assume that production function is given by  $y = AL^{1/2}$  ( $A$  is a constant),  $y$  is the output of wheat,  $L$  is the input of labor and land is a fixed input implicit in the production function. In addition, the worker has a utility function given by  $u(x,z) = \alpha \log x + (1-\alpha) \log z$ , where  $x$  is the consumption of wheat and  $z = L^\wedge - L$  is leisure ( $L$  is labor supply and  $L^\wedge$  is total labor hour). Furthermore, the landlord obtains rent in terms of wheat and consumes it.

(i) Setting price of wheat at 1. Find a competitive equilibrium of the above economy.

(ii) Show what would happen to the wage rate and the rent when  $L^\wedge$  increase

(iii) Show what would happen to the wage rate and the rent when  $A$  increases.

18. Suppose an individual's utility function is  $u(w) = -e^{-aw}$ , where  $w$  is net wealth, and  $a$  is a positive constant. Suppose the individual's initial wealth is  $w_0$ , and a loss of magnitude  $L$  can occur with probability  $p$ . Insurance can be purchased at the price  $\pi$  for each dollar of coverage, with  $\pi > p$ .

(i) Is this individual risk neutral, risk averse, or risk loving?

(ii) Find the amount of insurance that he will purchase,  $q^*$ .

(iii) Offer intuitions for the effect of  $a$  on  $q^*$ .

(iv) Comment on the income effect on the demand for insurance, i.e.,  $\partial q^* / \partial w_0$ .

In general, what determines the sign of  $\partial q^* / \partial w_0$ ?

(v) How would your answer to (b) change if  $\pi = p$ ? How would your answer to (c) change? Is there any inconsistency? Comment.