

Economics 500: Microeconomic Theory

State University of New York at Binghamton

Department of Economics

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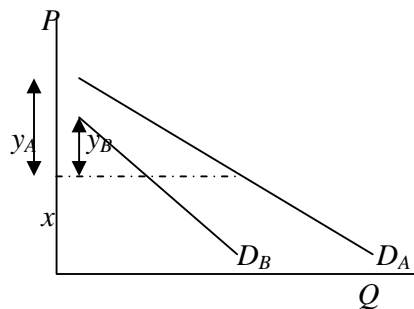
Final

The exam has eight questions and is worth 100 points. Each question is of equal value.

1. True or False (Explain briefly and use an example and/or state assumptions if necessary)?

(a) If, for every possible price, the quantity demanded of a commodity at that price is greater in market A than in market B, then the price elasticity of demand for the commodity is necessarily more elastic in market A than in market B.

False.



$$e_{Q,P} = -x/y$$

$$e_{Q,P}^A = -x/y_A < -x/y_B = e_{Q,P}^B, \text{ less elastic in market A.}$$

(b) On a non-linear demand curve, constant price elasticity is impossible.

False.

$$Q = I/P, e_{Q,P} = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} = -\frac{1}{P^2} \cdot \frac{P}{Q} = -\frac{1}{PQ} = -1, \text{ for any } Q, P.$$

2. Answer both

(a) J. Trueblue always spends one-third of his income on American flags. Show his income elasticity of demand for such flags. Also, show his price elasticity of demand for flags.

$$PQ = I/3, Q = I/3P$$

$$e_{Q,I} = \frac{\partial Q}{\partial I} \cdot \frac{I}{Q} = \frac{1}{3} \cdot \frac{1}{P} \cdot \frac{I}{Q} = \frac{1}{3} \cdot \frac{I}{\frac{1}{3}I} = 1$$

$$e_{Q,P} = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} = -\frac{1}{3} \cdot \frac{I}{P^2} \cdot \frac{P}{Q} = -\frac{1}{3} \cdot \frac{I}{PQ} = -\frac{1}{3} \cdot \frac{I}{\frac{1}{3}I} = -1$$

- (b) Use the fact that the demand functions are homogenous of degree zero in all prices and income (in other words, if we multiply all prices and income by the same constant, the optimal demand bundle will not change) to show that $e_{Q_x, P_x} + e_{Q_x, P_y} + e_{Q_x, I} = 0$.

Hint: Use Euler's theorem which states that if a function $f(Z_1, Z_2, \dots, Z_n)$ is homogenous of degree m , then $f_1 \cdot Z_1 + f_2 \cdot Z_2 + \dots + f_n \cdot Z_n = m \cdot f(Z_1, Z_2, \dots, Z_n)$.

$$Q_x = D_x(P_x, P_y, I)$$

$$0 = \frac{\partial D_x}{\partial P_x} \cdot P_x + \frac{\partial D_x}{\partial P_y} \cdot P_y + \frac{\partial D_x}{\partial I} \cdot I$$

$$0 = \frac{\partial D_x}{\partial P_x} \cdot \frac{P_x}{Q_x} + \frac{\partial D_x}{\partial P_y} \cdot \frac{P_y}{Q_x} + \frac{\partial D_x}{\partial I} \cdot \frac{I}{Q_x}$$

$$0 = e_{Q_x, P_x} + e_{Q_x, P_y} + e_{Q_x, I}$$

3. True or False (Explain briefly and use an example and/or state assumptions if necessary)?

- (a) If good X is a gross substitute for Y, then Y must be a gross substitute for X.

False.

Only true for net substitutes.

- (b) If good X is an inferior good, then good Y must be a normal good.

False.

If there exists 3 goods, good X and Y may both be inferior.

4. Answer both

- (a) Show that the marginal rate of technical substitution is equal to the marginal product of labor divided by the marginal product of capital.

$$q = q(K, L)$$

$$dq = \frac{\partial q}{\partial K} dK + \frac{\partial q}{\partial L} dL \rightarrow dq = MP_K dK + MP_L dL$$

Since Δq along the isoquant is 0.

$$-MP_L dL = MP_K dK \rightarrow -dL/dK = MP_K/MP_L \rightarrow MRTS = MP_K/MP_L$$

- (b) Show that marginal revenue is a function of the price elasticity of demand.

$$MR = \frac{\partial TR}{\partial q} = \frac{\partial (P(q)q)}{\partial q} = P + q \cdot \frac{\partial P}{\partial q} = P \left(1 + \frac{q}{P} \cdot \frac{\partial P}{\partial q} \right) = P \left(1 + 1/e_{Q,P} \right)$$

6. True or False (Explain briefly and use an example and/or state assumptions if necessary)?

(a) A monopolist will never provide a Pareto efficient level of output on its own.

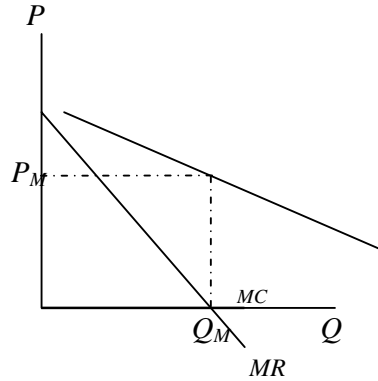
False.

It will if there is a price discriminate or give credit for the polluting monopolist.

(b) A price making, profit maximizing firm will choose any point on the demand curve if the marginal cost is zero.

False.

It will always produce when $MR=MC$.



7. True or False (Explain briefly and use an example and/or state assumptions if necessary)?

(a) If we know the contract curve, then we know the outcome of any trading.

False.

If we know the core, then we know the outcome of any trading.

(b) No individual can be made better off if we are at a Pareto efficient allocation.

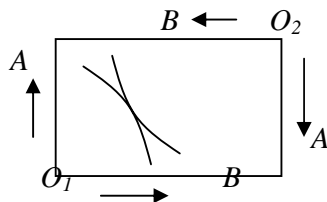
False.

Any person can be made better off, it just means that at least one person will be made worse off and we are no longer P.O.

8. Answer both

(a) There are two agents with identical, strictly convex preferences and equal endowments. Describe the core of this economy and illustrate it in an Edgeworth box.

If we equal endowments and equal preference, the $MRS_1=MRS_2$ and thus we are P.O. → the point we are at (initial endowment) is P.O. and also the core.



(b) Suppose 10 people live on a street and that each of them is willing to pay \$2 for each extra streetlight, regardless of the number of streetlights provided. If the cost of providing x streetlights is given by $c(x) = x^2$, what is the Pareto efficient number of streetlights to provide?

$$MR=10.2, \text{ any } x$$

$$c(x) = x^2 \rightarrow MC=2x \rightarrow x=10$$