ECON 173 - Intermediate Microeconomic Analysis
Drake University, Fall 2023
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Signature: _____

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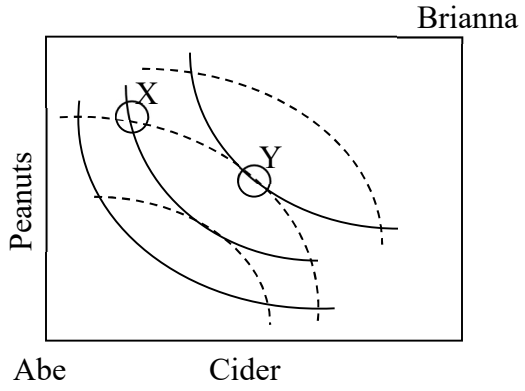
EXAMINATION 4 VERSION A
"General Equilibrium and Market Power"
November 21, 2023

INSTRUCTIONS: This exam is closed-book, closed-notes. Calculators, mobile phones, and wireless devices are NOT permitted. Point values for each question are noted in brackets.

I. MULTIPLE CHOICE: Circle the one best answer to each question. Feel free to use margins for scratch work [1 pt each—12 pts total].

The next two questions refer to the following Edgeworth box diagram for consumption. The solid curves are Abe's indifference curves. The dashed curves are Brianna's indifference curves.



(1) From allocation X, *both* consumers can enjoy greater utility if
a. Abe gives Brianna some peanuts, and Brianna gives Abe some cider.
b. Abe gives Brianna some cider, and Brianna gives Abe some peanuts.
c. Abe gives Brianna some peanuts and some cider.
d. Brianna gives Abe some peanuts and some cider.
e. No trade will allow both consumers to enjoy greater utility.

(2) From allocation Y, *both* consumers can enjoy greater utility if
a. Abe gives Brianna some peanuts, and Brianna gives Abe some cider.
b. Abe gives Brianna some cider, and Brianna gives Abe some peanuts.
c. Abe gives Brianna some peanuts and some cider.
d. Brianna gives Abe some peanuts and some cider.
e. No trade will allow both consumers to enjoy greater utility.

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(3) Suppose a car dealer with market power is selling five cars per day at $10,000 each. If it cuts the price to $9,000, it can sell one more car (that is, six cars per day). Marginal revenue for the sixth car is thus
a. $10,000.
b. $9,000.
c. $5,000.
d. $4,000.
e. $1,000.

(4) An industry is a natural monopoly if
a. the industry became a monopoly without government interference.
b. the only seller in the market sells a natural or "green" product.
c. one firm owns all the key natural resources required to produce the product.
d. a firm's average cost is negatively related to its quantity.

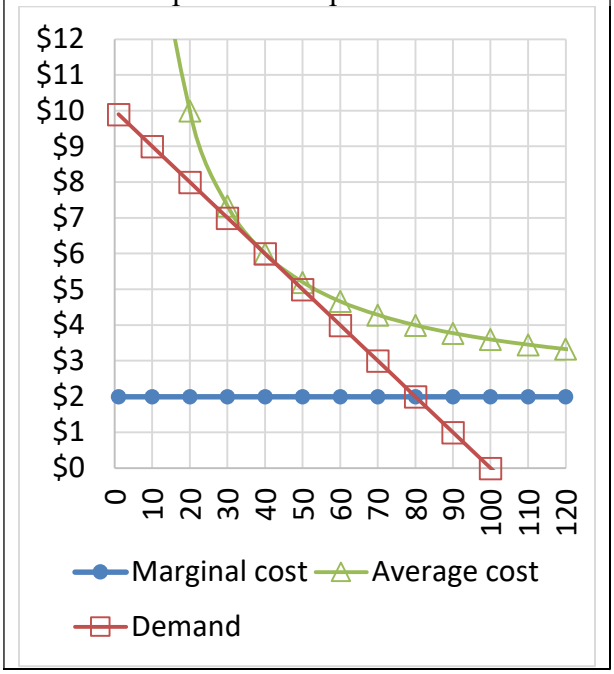
(5) Monopoly causes economic inefficiency because
a. monopolists are usually wealthier than their customers.
b. some consumers, willing to pay the marginal cost of the product, are not served.
c. monopolists enjoy profits, called monopoly rents, even in the long run.
d. monopoly prices are unfair.
e. it is unfair for one firm to control the market.

(6) Perfect price discrimination is impractical because
a. firms in the real world do not maximize profit.
b. firms cannot know how much each customer is willing to pay.
c. monopolies do not exist.
d. firms do not know their true marginal costs.

(7) One implication of the Cournot model of oligopoly is that the equilibrium price is lower,
a. the more firms are in the industry.
b. the more elastic is market demand.
c. both of the above.
d. none of the above.

(8) The term "differentiated products" means, in economics,
a. the derivative of a firm's output.
b. the derivative of a firm's revenue with respect to its output.
c. products that are not perfect substitutes.
d. products that a firm sells to different customers at different prices.
e. products for which different consumers have different elasticities of demand.

The next two questions refer to the following graph of a representative firm under monopolistic competition.



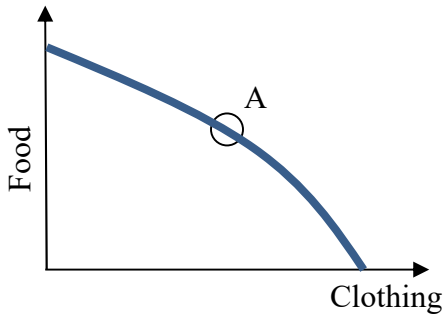
(9) Long-run equilibrium quantity for this firm is about
a. 20 units of output.
b. 40 units of output.
c. 60 units of output.
d. 80 units of output.
e. 100 units of output.

(10) Long-run equilibrium price for this firm is about

a. $2 .
b. $4 .
c. $6 .
d. $8 .
e. $10 .

II. SHORT ANSWER: Please write your answers in the boxes on this question sheet. Use margins for scratch work.

(1) [General equilibrium: 8 pts] Consider the graph at right of an economy's production-possibility curve. Assume this economy is in general competitive equilibrium at point A, where the slope of the production-possibility curve is **–3**.



a. What is the opportunity cost of a unit of clothing? In other words, how many units of food must be given up in order to produce one more unit of clothing? — units of food
b. What is the opportunity cost of a unit of food? In other words, how many units of clothing must be given up in order to produce one more unit of food? — units of clothing
c. Consider the typical consumer's budget line with food on the vertical axis and clothing on the horizontal axis. What must be the slope of every consumer's budget line in this economy?
d. If the price of a unit of food is **$ 6**, then what must be the price of a unit of clothing? — $

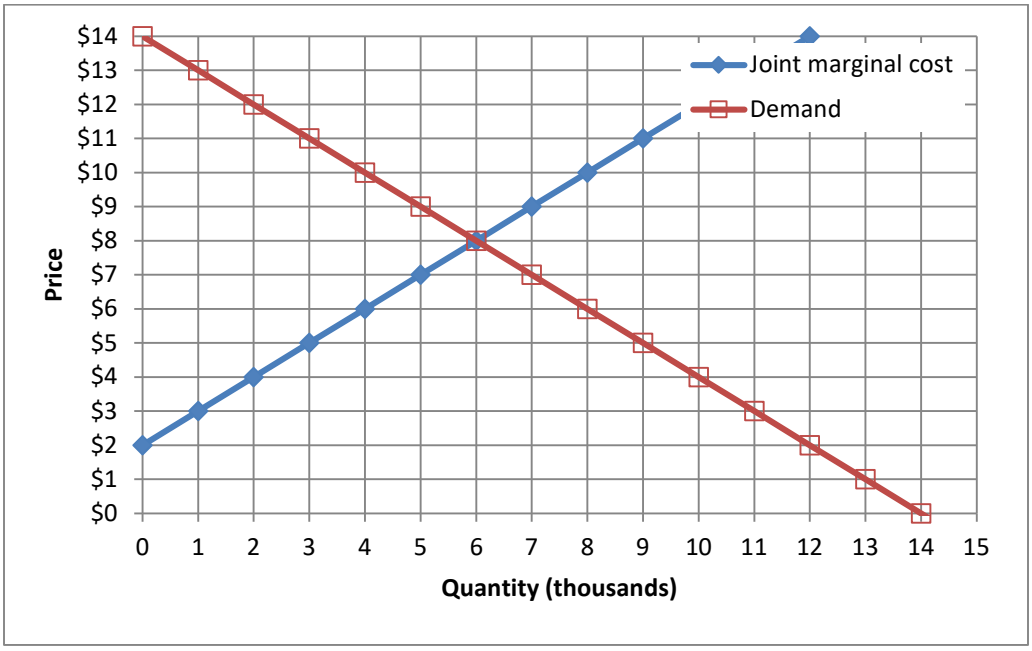
(2) [Monopoly price discrimination: 4 pts] Suppose a amusement park believes that the elasticity of demand for admission by adults is -2, and the elasticity of demand by children is -5. Assume the park has a marginal cost of $20 per admission.

a. Compute the amusement park's profit-maximizing admission price for adults.	$
b. Compute the amusement park's profit-maximizing admission price for children.	$

(6) [Comparison of models: 6 pts] In long-run equilibrium, which models predict that price equals each firm's marginal cost, and which models predict that price equals each firm's average cost? Write YES or NO in each box.

	P = MC	P = AC
a. Perfect competition.		
b. Monopoly.		
c. Monopolistic competition.		

(4) [Collusion/joint profit maximization: 16 pts] Three firms produce vitamins. Market demand and the three firms' joint marginal cost are shown in the graph below.



First, suppose these firms engage in price competition.

a. Compute competitive equilibrium market price. $

b. Compute competitive equilibrium market quantity. thousand

c. Compute the amount of deadweight loss. $ thousand

Now suppose these firms form a cartel to maximize jointly the sum of their profits. The equation for demand is **P = 14 – Q**, where Q = quantity in thousands.

d. Find the equation for the cartel's marginal revenue.

MR =

e. Carefully plot and label the cartel's marginal revenue curve in the graph above.

f. What price will the firms jointly set? $

g. How much output will the firms produce, in total? thousand

h. Compute the amount of deadweight loss. $ thousand

(5) [Game theory: 12 pts] Companies X and Y make dish detergent. Each company finds that advertising is costly but helps attract customers away from its rival. Their situation is expressed by the following game in normal form.

		Company Y	
		Advertise	Do not advertise
Company X	Advertise	X gets \$2 million. Y gets \$2 million.	X gets \$5 million. Y gets \$1 million.
	Do not advertise	X gets \$1 million. Y gets \$5 million.	X gets \$4 million. Y gets \$4 million.

a. Which outcomes of this game (if any) are Pareto-optimal[1]? Answer "YES" or "NO."

Company X plays "Advertise" and Company Y plays "Advertise"	
Company X plays "Advertise" and Company Y plays "Do not advertise"	
Company X plays "Do not advertise" and Company Y plays "Advertise"	
Company X plays "Do not advertise" and Company Y plays "Do not advertise"	

b. Which outcomes of this game (if any) are dominant-strategy equilibria[2]? Answer "YES" or "NO."

Company X plays "Advertise" and Company Y plays "Advertise"	
Company X plays "Advertise" and Company Y plays "Do not advertise"	
Company X plays "Do not advertise" and Company Y plays "Advertise"	
Company X plays "Do not advertise" and Company Y plays "Do not advertise"	

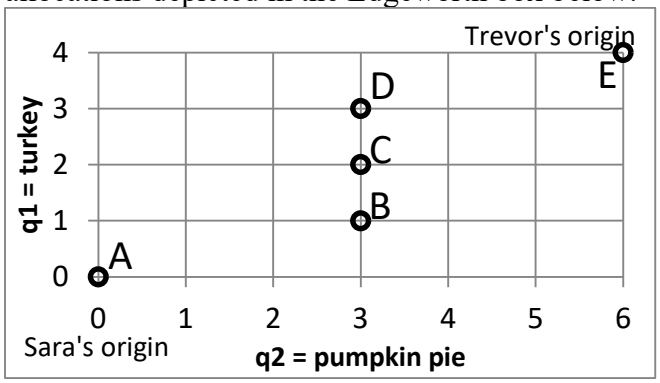
c. Which outcomes of this game (if any) are Nash equilibria in pure strategies? Answer "YES" or "NO."

Company X plays "Advertise" and Company Y plays "Advertise"	
Company X plays "Advertise" and Company Y plays "Do not advertise"	
Company X plays "Do not advertise" and Company Y plays "Advertise"	
Company X plays "Do not advertise" and Company Y plays "Do not advertise"	

[1] Ignore the welfare of consumers.
[2] "Equilibria" is the plural form of "equilibrium."

III. PROBLEMS: Please write your answers in the boxes on this question sheet. Show your work and circle your final answers.

(1) [Exchange efficiency: 12 pts] Sara and Trevor both like turkey (q_1) and pumpkin pie (q_2). Sara's utility function is $\mathbf{U_S = q_1\, q_2}$. Trevor's utility function is $\mathbf{U_T = q_1\, q_2^3}$. A total of 4 servings of turkey and 6 slices of pumpkin pie must be divided between them. Consider the allocations depicted in the Edgeworth box below.



a. Is allocation A Pareto-efficient? Why or why not?

b. Is allocation B Pareto-efficient? Why or why not?

c. Is allocation C Pareto-efficient? Why or why not?

d. Is allocation D Pareto-efficient? Why or why not?

e. Is allocation E Pareto-efficient? Why or why not?

f. **Sketch and label the contract curve** in the Edgeworth box above.

(2) [Monopoly, profit maximization: 14 pts] Suppose a monopolist has total cost function given by **$TC(Q) = Q + (Q^2/20)$.** This monopolist faces a demand curve given by **$P = 13 - (Q/20)$.** Show your work and circle your final answers. Note: question continues on next page. Use graph at bottom of next page for scratch work.

a. Find the monopolist's marginal cost function.

b. Find the monopolist's average cost function.

c. Find the monopolist's marginal revenue function.

d. Compute the monopolist's profit-maximizing level of output Q_M.

e. Compute the monopolist's profit-maximizing price P_M.

f. Compute the monopolist's profit.

g. Compute the social deadweight loss caused by the monopolist. (You may use the graph for scratch work.)

(3) [Cournot duopoly: 14 pts] Suppose two makers of a consumer good form a symmetric Cournot duopoly, each firm setting its own quantity while taking the other firm's quantity as given. Let q_1 = firm #1's quantity and q_2 = firm #2's quantity, so that total market quantity $Q = q_1 + q_2$. The market demand curve is **$P = 20 - (Q/10)$.** Each firm has constant marginal and average cost equal to **$2**. Show your work and circle your final answers. Note: question continues on next page. Use graph at bottom of next page for scratch work.

a. Find an expression for firm #1's revenue, as a function of its own quantity and the quantity produced by the other firm: $TR_1(q_1,q_2)$.

b. Find an expression for firm #1's marginal revenue, as a function of its own quantity and the quantity produced by the other firm: $MR_1(q_1,q_2)$.

c. Find an expression for firm #1's reaction function, showing how much firm #1 will produce for any given quantity set by the other firm: $q_1^* = f(q_2)$.

d. Assume the equilibrium is symmetric (that is, assume $q_1^* = q_2^*$) and compute firm #1's equilibrium quantity q_1^*.

e. Compute total market quantity Q* and the equilibrium price P*.

f. Compute the combined total profit of both firms.

g. Compute the social deadweight loss.

IV. CRITICAL THINKING: Answer just *one* of the questions below (your choice). [4 pts]

(1) Reconsider the monopoly in problem (2) above. Suppose the firm is capable of setting a separate price for every unit sold, engaging in perfect price discrimination. Compute the firm's profit maximizing quantity, its revenue, and its profit. Show your work and circle your final answers. (You may use the graph for scratch work.)

(2) Reconsider the duopoly in problem (3) above. Suppose each firm maximizes its own profit while taking the other firm's *price* as given. Compute the equilibrium market quantity, the equilibrium price, and the combined total profit of both firms. Show your work and circle your final answers. (You may use the graph for scratch work.)

Circle the question you are answering and write your answer below. Full credit requires good grammar, legible writing, accurate spelling, and correct reasoning.

[end of exam]