ECON 173 - Intermediate Microeconomic Analysis
Drake University, Fall 2015
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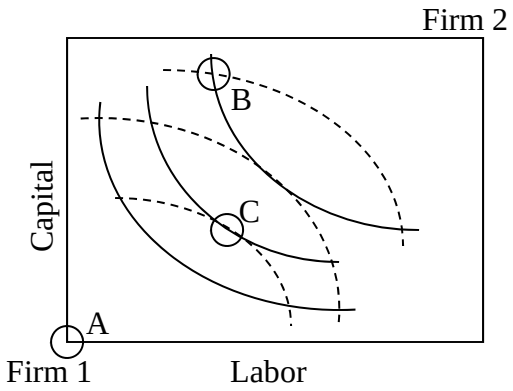
EXAMINATION #4 VERSION C
"General Equilibrium and Market Power"
November 24, 2015

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—10 pts total].

The next two questions refer to the following Edgeworth box diagram for production. The solid curves are Firm 1's isoquants. The dashed curves are Firm 2's isoquants.

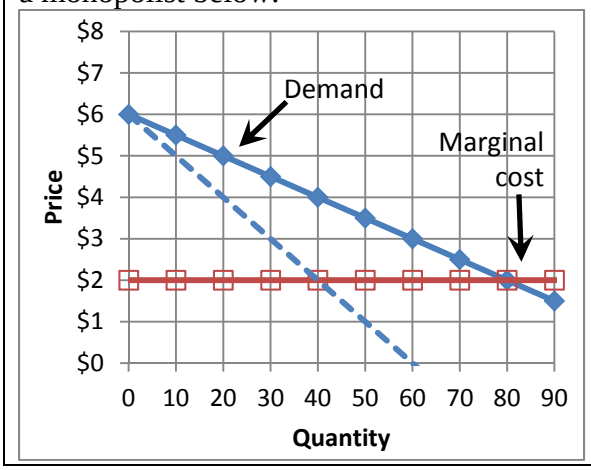


(1) From allocation B, *both* firms can produce more output if
a. Firm 1 gives Firm 2 some capital, and Firm 2 gives Firm 1 some labor.
b. Firm 1 gives Firm 2 some labor, and Firm 2 gives Firm 1 some capital.
c. Firm 1 gives Firm 2 some capital and some labor.
d. Firm 2 gives Firm 1 some capital and some labor.
e. No trade will allow both firms to produce more output.

(2) The contract curve for this Edgeworth box diagram does *not* pass through
a. Allocation A.
b. Allocation B.
c. Allocation C.
d. The contract curve passes through all three allocations.
e. The contract curve does not pass through any of these three allocations.

(3) Which equation for average cost implies that the firm enjoys a natural monopoly?
a. $AC(q) = 5 + 200\ q^{-1}$.
b. $AC(q) = 0.002\ q^2 + 0.01\ q + 4$.
c. $AC(q) = 3$.
d. $AC(q) = 0.5\ q$.
e. $AC(q) = 2 - 0.1\ q^{-1}$.

The next two questions refers to the graph of a monopolist below.



(4) What quantity of output will the monopolist choose if it must charge the *same* price to all customers?
a. 40 units.
b. 50 units.
c. 60 units.
d. 70 units.
e. 80 units.

(5) What quantity of output will the monopolist choose if it can engage in *perfect price discrimination?*
a. 40 units.
b. 50 units.
c. 60 units.
d. 70 units.
e. 80 units.

(6) The Cournot model of oligopoly assumes that each firm maximizes its profit while taking its rivals'
a. output quantities as given.
b. costs as given.
c. prices as given.
d. all of the above.

(7) Which market model predicts the highest equilibrium price?
a. Collusion to maximize joint profits.
b. Cournot oligopoly.
c. Price competition.
d. All models predict the same equilibrium price, if all use the same assumptions about market demand and marginal cost.

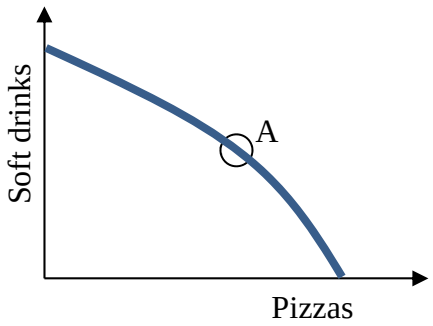
(8) The model of monopolistic competition assumes
a. firms cooperate to maximize the sum of their profits.
b. firms produce perfect substitutes.
c. free entry of firms.
d. marginal revenue equals price.

(9) Equilibrium in the model of monopolistic competition implies
a. zero deadweight loss.
b. price equals marginal cost.
c. price equals average cost.
d. firms enjoy positive economic profits.

(10) Which of the following characterizes a Nash equilibrium of a game?
a. Neither player can be made better off without the other player being made worse off.
b. Each player is receiving the highest possible payoff in the game.
c. The sum of the payoffs for both players is maximized.
d. Neither player wants to change strategies unilaterally.

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 **–2**.



a. What is the opportunity cost of a soft drink? In other words, how many pizzas must be given up in order to produce one more soft drink?
b. What is the opportunity cost of a pizza? In other words, how many soft drinks must be given up in order to produce one more pizza?
c. Consider the typical consumer's budget line with soft drinks on the vertical axis and pizzas on the horizontal axis. What must be the slope of every consumer's budget line in this economy?
d. If the price of pizzas is **$ 12**, then what must be the price of soft drinks?

pizzas
soft drinks
$

(2) [Monopoly price discrimination: 4 pts] Suppose an amusement park believes that the elasticity of demand for admission tickets by adults is −2, and the elasticity of demand by children is −7 . Assume the park has a marginal cost of $12 per ticket.

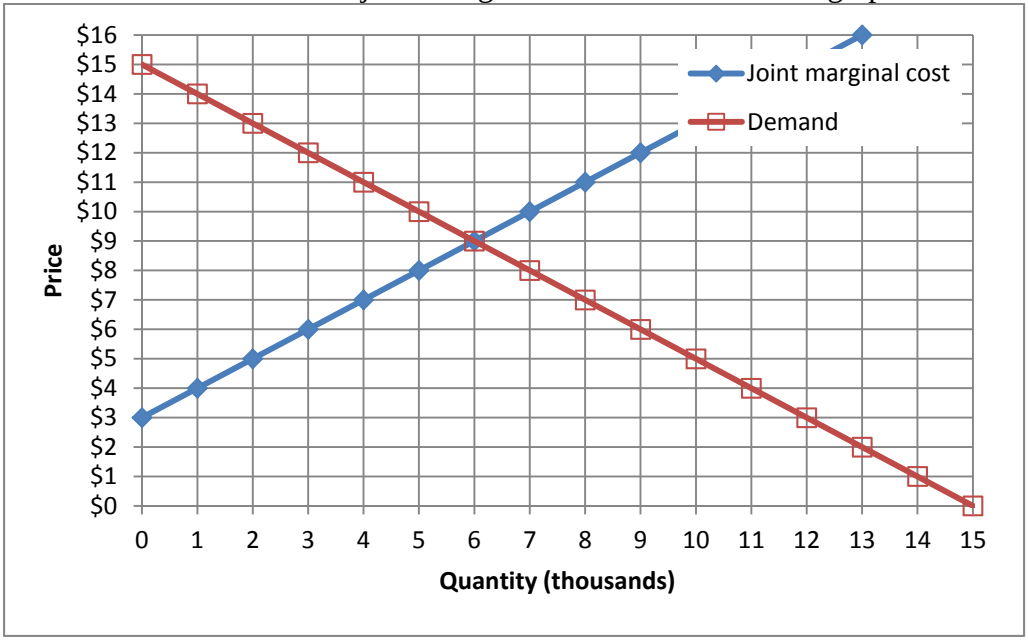
a. Compute the park's profit-maximizing ticket price for adults.
b. Compute the park's profit-maximizing ticket price for children.

$
$

(3) [Lerner index of market power: 3 pts] The Lerner index of market power is defined as the fraction of price that represents a markup over marginal cost: L = (P-MC)/P. Suppose the market for automobiles has a price elasticity of demand of -3.

a. Compute the Lerner index if the market for automobiles is a monopoly.
b. Compute the Lerner index if the market for automobiles is a symmetric Cournot oligopoly of three firms.
c. Compute the Lerner index if the market for automobiles is a symmetric Cournot oligopoly of ten firms.

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



First, suppose the three firms form a cartel to maximize jointly the sum of their profits. The equation for demand is **P = 15 – Q**, where Q = quantity in thousands.

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

MR =

b. Plot and label the cartel's marginal revenue curve in the graph above.

c. What price will the firms jointly set? $

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

e. Compute the amount of deadweight loss. $ thousand

Alternatively, suppose the three firms engage in price competition.

f. Compute competitive equilibrium market price. $

g. Compute competitive equilibrium market quantity. thousand

h. Compute the amount of deadweight loss. $ thousand

(5) [Game theory: 12 pts] Big Firm has been the only firm in a certain market so it can set the market price. Upstart Firm is deciding whether to enter this market. The following table describes their interaction as a game in normal form.

		Big Firm	
		Low price	High price
Upstart Firm	Stay out of market	Upstart gets \$0 million. Big gets \$-2 million.	Upstart gets \$0 million. Big gets \$15 million.
	Enter market	Upstart gets \$-5 million. Big gets \$-2 million.	Upstart gets \$5 million. Big gets \$10 million.

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

Upstart Firm plays "Stay out" and Big Firm plays "Low price"	
Upstart Firm plays "Stay out" and Big Firm plays "High price"	
Upstart Firm plays "Enter market" and Big Firm plays "Low price"	
Upstart Firm plays "Enter market" and Big Firm plays "High price"	

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

Upstart Firm plays "Stay out" and Big Firm plays "Low price"	
Upstart Firm plays "Stay out" and Big Firm plays "High price"	
Upstart Firm plays "Enter market" and Big Firm plays "Low price"	
Upstart Firm plays "Enter market" and Big Firm plays "High price"	

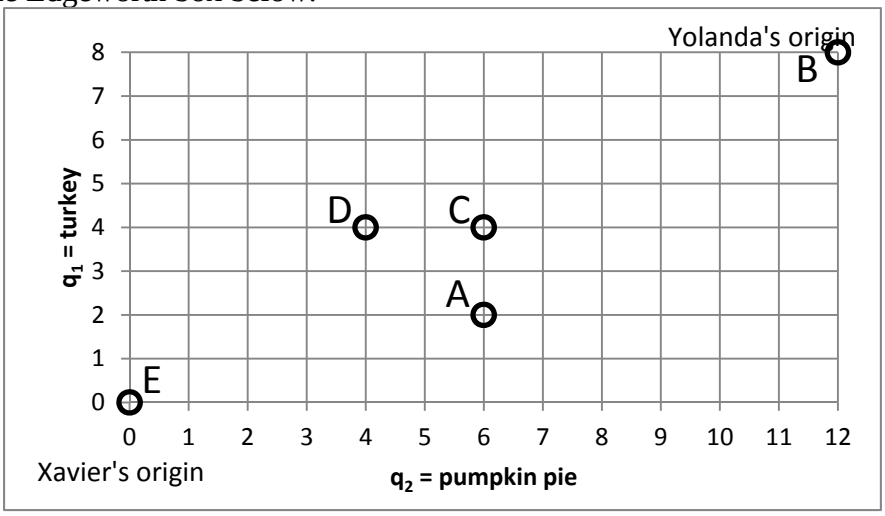
c. Which outcomes of this game (if any) are Nash equilibria in pure strategies? Answer "YES" or "NO."

Upstart Firm plays "Stay out" and Big Firm plays "Low price"	
Upstart Firm plays "Stay out" and Big Firm plays "High price"	
Upstart Firm plays "Enter market" and Big Firm plays "Low price"	
Upstart Firm plays "Enter market" and Big Firm plays "High price"	

[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] Xavier and Yolanda both like turkey (q_1) and pumpkin pie (q_2). Xavier's utility function is $U_X = q_1 q_2$. Yolanda's utility function is $U_Y = q_1 q_2^2$. A total of 8 units of turkey and 12 units 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: 14 pts] Suppose a monopolist has total cost function given by $TC(Q) = Q + (Q^2/10)$. This monopolist faces a demand curve given by $P = 25 - (Q/10)$. Note: question continues on next page. Use graph at the bottom of next page for scratch work.

a. Find the monopolist's marginal cost function.

b. Find the monopolist's average cost function.

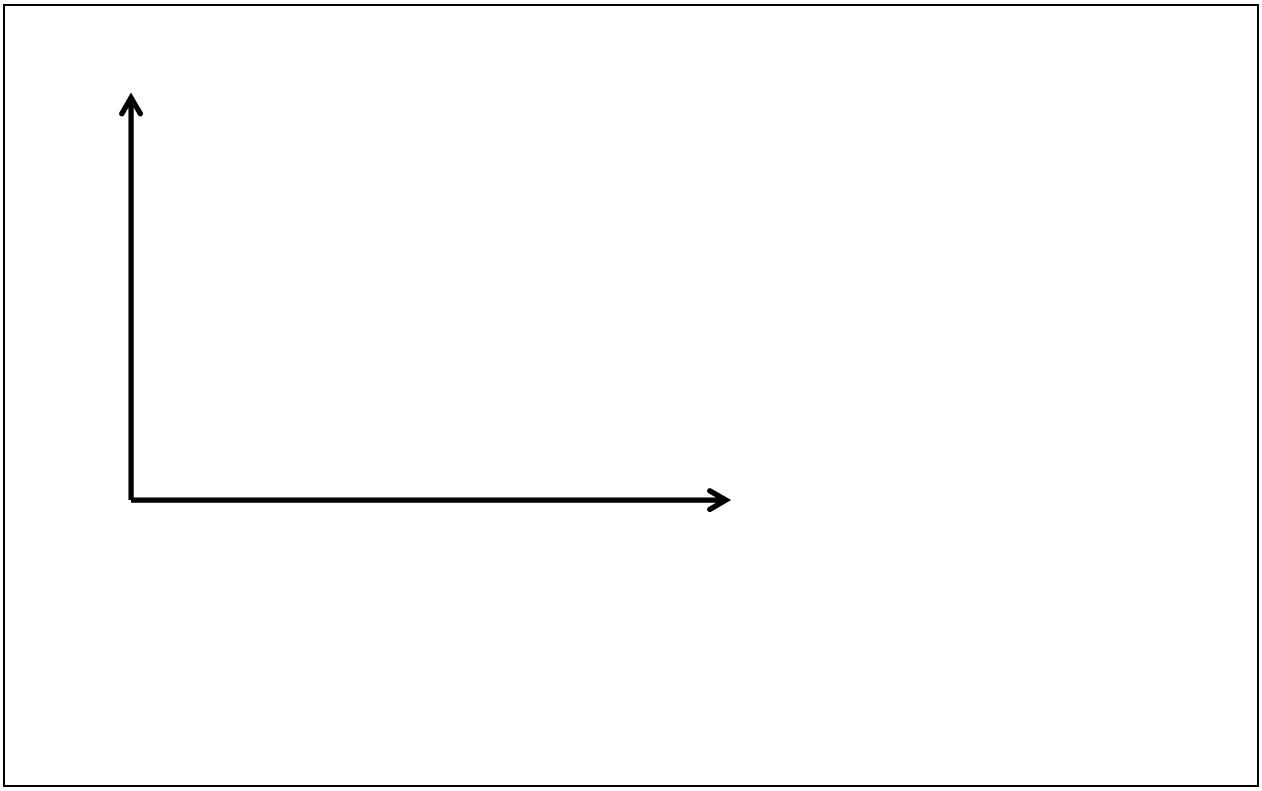
c. Find the monopolist's marginal revenue function.

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

e. Compute the monopolist's profit-maximizing price P*.

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 $P = 17 - (Q/5)$. Each firm has constant marginal and average cost equal to \$5. 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: $Rev_1(q_1,q_2)$.

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: $MR_1(q_1,q_2)$.

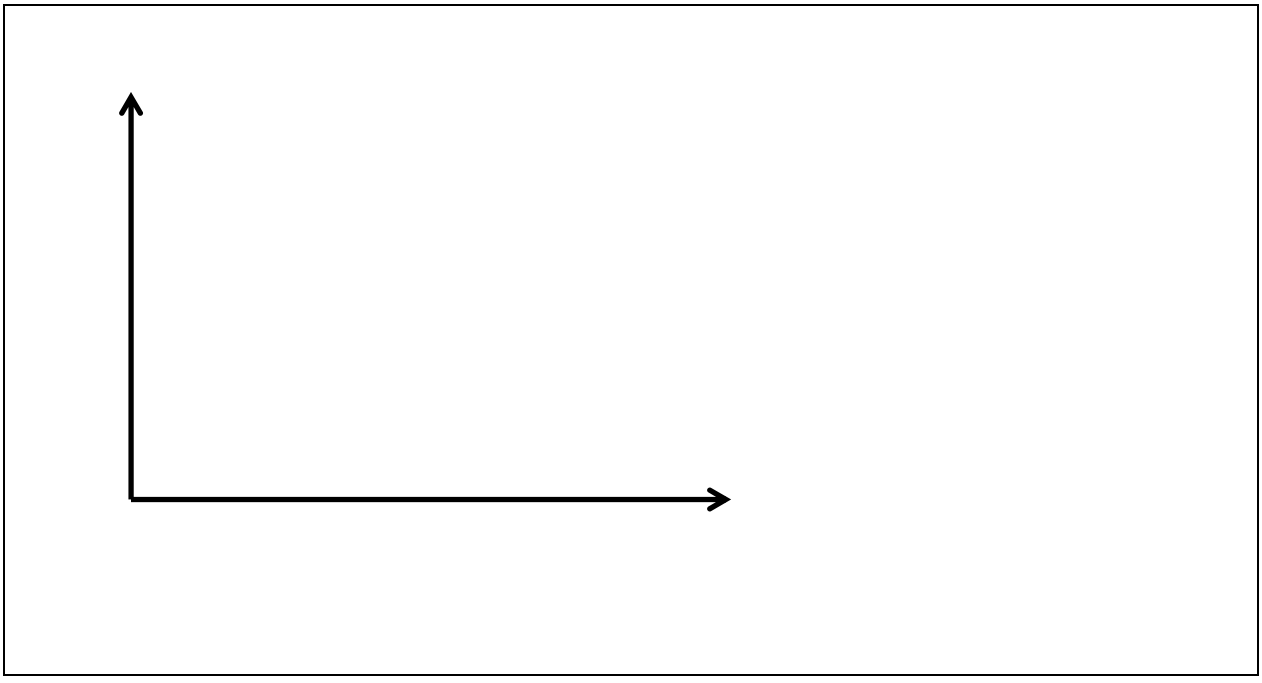
c. Find an expression for firm #1's reaction function, showing how much firm #1 will produce for any given quantity set by the other firm: $q_1^* = f(q_2)$.

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 total profit of both firms.

g. Compute the social deadweight loss.



IV. CRITICAL THINKING: Answer just *one* of the questions below (your choice). [7 pts]

(1) Suppose *three* firms form a symmetric Cournot *triopoly*. Each firm chooses its quantity of output to maximize its own profit, taking as given the output levels of the other two firms. The marginal cost of each firm is constant and equal to \$3. The market demand curve is given by $P = 15 – (Q/100)$. What quantity will each firm produce? What will be the market price? Show your work and circle your final answers.

(2) Suppose there are two firms in a market, each with marginal cost and average cost equal to \$5. The firms choose *prices* (not quantities as in a Cournot game). Assume initially that Firm A has chosen an price of \$10.

a. What price is Firm B's best reply to Firm A's initial price? Why?
b. What price is Firm A's best reply to Firm B's price? Why?
c. What is the Nash equilibrium of this game? Why?

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]