ECON 180 - Regulation & Antitrust Policy
Drake University, Spring 2013
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Signature: _____

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QUIZ 5 VERSION A
"Oligopoly and Collusion"

INSTRUCTIONS: This exam is closed-book, closed-notes. Simple calculators are permitted, but graphing calculators or calculators with alphabetical keyboards are NOT permitted. Mobile phones or other wireless devices are NOT permitted. Points will be subtracted for illegible writing or incorrect rounding. Point values for each question are noted in brackets.

I. Multiple choice: Circle the one best answer to each question. [2 pts each: 10 pts total]

(1) Suppose a certain industry is served by a symmetric Cournot oligopoly of four firms. If the elasticity of market demand is -2.5, the Lerner index (or "price-cost margin") in equilibrium equals
a. 0.04 .
b. 0.10 .
c. 0.20 .
d. 0.25 .
e. 2.5 .

(2) Suppose firm A has marginal cost $MC_A = 2 + (q_A/20)$, and firm B has marginal cost $MC_B = 1 + (q_B/10)$. Suppose the two firms want to produce a total of 100 units of output as minimum combined total cost. Which output allocation would minimize the combined total cost of both firms?
a. Each firm produces 50 units.
b. Firm A produces 60 units and firm B produces 40 units.
c. Firm A produces 80 units and firm B produces 20 units.
d. Firm A produces zero units and firm B produces 100 units.

(3) After firms agree to maximize their joint profits, each firm will have an incentive to cheat on any agreement by quietly
a. raising its price.
b. lowering its output level.
c. lowering its price.
d. none of the above.

(4) Under U.S. law, price-fixing is illegal
a. if price is raised significantly above marginal cost.
b. *per se*, except in industries Congress has exempted.
c. if total market quantity is reduced significantly below the competitive quantity.
d. if significant deadweight loss can be shown.

(5) In private antitrust suits against price-fixing, injured parties can collect damages
a. multiplied by two.
b. multiplied by three.
c. multiplied by five.
d. multiplied by ten.

II. Problems: Insert your answer to each question below in the box provided. Use the margins and graphs for scratch work—only the answers in the boxes will be graded. Work carefully—partial credit is not normally given for questions in this section.

(1) [Game theory: 24 pts] Two restaurant chains, "Jimmy's" and "John's" are choosing locations for a new restaurant. The downtown location is more profitable than the uptown location. If the chains pick different locations, the downtown chain enjoys a profit of $600,000 and the uptown chain enjoys a profit of $400,000. If the chains choose the same location, they split the business. If both chains locate downtown, they each enjoy a profit of $300,000. If both chains locate uptown, they each enjoy a profit of $200,000. The diagram below is intended to show this game in normal (or strategic) form.

		John's	
		_____	_____
Jimmy's	_____	Jimmy's gets _____. John's gets _____.	Jimmy's gets _____. John's gets _____.
	_____	Jimmy's gets _____. John's gets _____.	Jimmy's gets _____. John's gets _____.

a. Complete the diagram by inserting the chains' *strategies*.
b. Complete the diagram by inserting the chains' *payoffs*.
c. Find all the Nash equilibria[1] in pure strategies of this game (if there are any). Describe each such equilibrium by listing the *strategies* chosen by each chain.

(2) [Oligopolist's marginal revenue: 15 pts] Suppose four flower stands (A, B, C, and D) are each selling 10 bouquets per hour, for a total output of Q=40 bouquets. Assume all flowers are identical, so each stand must charge the same price. Assume each stands' marginal cost is $2. The market price is now $10 and the slope of the demand curve is $\Delta P/\Delta Q = -0.50$. Suppose Stand A sells one more bouquet while the other stands keep their output constant. (Note that the price must fall and remain equal at all four flower stands.)

a. What is the new market price?	$
b. Will Stand A's profit increase or decrease?	
c. By how much?	$
d. Will the total profit of all four stands increase or decrease?	
e. By how much?	$

[1] "Equilibria" is the plural form of "equilibrium."

(3) [Cournot duopoly: 21 pts] Suppose the market for vitamins is served by only two firms. Suppose two firms 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 $P = 20 - (Q/100)$. Each firm has constant marginal and average cost equal to \$2. Circle your final answers. Use the space at the bottom of the 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: $Rev_1(q_1,q_2)$. [Hint: By definition, $Rev_1 = P\ q_1$. Here, replace P by the equation for the demand curve, and then replace Q by $(q_1 + q_2)$.]

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: $MR_1(q_1,q_2)$. [Hint: $MR_1(q_1,q_2) = dRev_1(q_1,q_2) / dq_1$.]

c. Find an expression for firm #1's reaction function (or best reply function), showing how much firm #1 will produce for any given level of quantity set by the other firm: $q_1^* = f(q_2)$. [Hint: Set $MR_1 = MC$ and solve for q_1 as a function of q_2 .]

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

Question continues on next page.

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

f. Compute the Lerner index of market power [(P-MC)/P].

g. Compute the social deadweight loss from Cournot duopoly.

(4) [Joint profit maximization: 24 pts] Again suppose the market for vitamins is served by only two firms, but suppose they behave differently from the last problem. As before, the market demand curve is $P = 20 - (Q/100)$. Each firm has constant marginal and average cost equal to $2. Use the graph below for scratch work.

First assume the firms engage in *price competition*.

a. What is the equilibrium price?	$
b. What is the equilibrium quantity?	units
c. Compute the social deadweight loss from price competition.	$
d. Compute the Lerner index of market power [(P-MC)/P] under price competition.	

Next assume the firms collude, forming a cartel to *maximize the sum of their profits*.

e. What quantity will they produce, in total?	units
f. What price will they set?	$
g. Compute the social deadweight loss from collusion.	$
h. Compute the Lerner index of market power [(P-MC)/P] under collusion.	

III. Critical thinking [6 pts]

Suppose there are two firms in the market for pizzas, each with marginal cost and average cost equal to $5. The firms choose *prices* (not quantities as in a Cournot game). If the firms choose different prices, buyers buy only from the lowest-price firm. If both firms choose the same price, buyers split their purchases evenly between the two firms. Assume initially that Firm A has chosen a 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 (from part (a))? Why?
c. What is the Nash equilibrium of this game? Why?

[end of quiz]