EXAMINATION 2
"Antitrust Theory"
March 22, 2018

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. Fractional answers are acceptable. Decimal answers, if rounded, must be correct to at least three significant digits. Points will be subtracted for illegible writing or incorrect rounding. Point values for each question are noted in brackets.

I. Multiple choice: Please circle the one best answer to each question. [1 pt each, 13 pts total]

(1) Suppose a flower vendor with market power is now selling 7 bouquets per hour at a price of $10. If he cuts the price to $9, he can sell one more bouquet per hour (that is, a total of 8 bouquets per hour). The vendor's marginal revenue for the eighth bouquet is therefore
a. $1.
b. $2.
c. $7.
d. $8.
e. $9.
f. $10.

(2) 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.

(3) 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.

(4) In the "Structure-Conduct-Performance" paradigm, "Structure" does not include
a. concentration.
b. elasticity of market demand.
c. deadweight loss.
d. current technology.

(5) An action by firms that is *per se* illegal
a. may be illegal if it appears to lessen competition.
b. may be illegal if it increases the firm's profit.
c. may be illegal if it decreases other firms' profits.
d. is always illegal regardless of circumstances.

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

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

(8) Suppose a certain industry is served by a symmetric Cournot oligopoly of 5 firms. If the elasticity of market demand is -2, the Lerner index (or "price-cost margin") in equilibrium equals
a. 0.1 .
b. 0.2 .
c. 0.3 .
d. 0.5 .

(9) The "joint marginal cost" curve under the model of joint profit maximization is the same as the
a. marginal revenue curve under monopoly.
b. supply curve under price competition.
c. market demand curve under Cournot oligopoly.
d. none of the above.

(10) A cartel member's "trigger strategy" discourages other cartel members from cheating by threatening to
a. raise members' costs.
b. raise the market price.
c. lower the market price to the competitive level for a long time.
d. admit new members to the cartel.

(11) Under the Department of Justice's corporate leniency program, amnesty can be given to
a. the first cartel member that cooperates with the government investigation.
b. the last cartel member that cooperates with the government investigation.
c. any cartel participants that cooperate with the government investigation.
d. any cartel participants that agree to leave the cartel.

(12) Although profits are greater in more highly concentrated industries, social welfare may also be greater in such industries, according to the
a. permanent income hypothesis.
b. collusion hypothesis.
c. differential efficiency hypothesis.
d. Bertrand model of price competition.

(13) One model says that an incumbent firm can deter entry by a second firm if it threatens to cut prices and to force both firms to make a loss. This model has been criticized because
a. cutting prices would actually increase profit.
b. the incumbent firm's threat is not credible.
c. the entrant firm will incur sunk costs and stay in the market regardless of the price.
d. cutting prices would increase total quantity demanded, which would only encourage the entrant.

II. Problems: Please insert your answer to each question in the box provided. Use 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) [Monopoly, markup formula, Lerner index: 4 pts] Whizzbang Roller Rink enjoys a local monopoly. Its marginal cost per customer is $4.00. The management believes the elasticity of demand for admissions is -3.

 a. What admission price should Whizzbang set, to maximize profit?

$

 b. Compute Whizzbang's Lerner index of market power [(P-MC)/P].

(2) [Antitrust statutes: 4 pts] Insert one of the following statutes in each box. You may insert the same statute into more than one box.

Clayton Act Section 7   *Federal Trade Commission Act*
Sherman Act Section 1   *Sherman Act Section 2*

a. "Every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade or commerce … shall be deemed guilty of a felony…"

b. "Unfair methods of competition in or affecting commerce, and unfair or deceptive acts or practices in or affecting commerce, are declared unlawful."

c. "Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce … is declared to be illegal."

d. "No corporation engaged in commerce shall acquire, directly or indirectly, the whole or any part of the stock … of another corporation engaged also in commerce, where ... the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly."

(3) [Cournot duopoly: 14 pts] Suppose a market is served by only two firms: Acme Products Company and Best Products Company. Suppose the two firms form a *symmetric Cournot duopoly*, each firm setting its own quantity while taking the other firm's quantity as given. Let q_A = Acme's quantity and q_B = Best's quantity, so that total market quantity $Q = q_A + q_B$. The market demand curve is $P = 21 - (Q/10)$. Each firm has constant marginal and average cost equal to \$3. Circle your final answers. Use the space at the bottom of the next page for scratch work.

a. Find an expression for Acme's revenue, as a function of its own quantity and the quantity produced by the other firm: $TR_A(q_A,q_B)$. [Hint: By definition, $TR_A = P\, q_A$. Here, replace P by the equation for the demand curve, and then replace Q by $(q_A + q_B)$.]

b. Find an expression for Acme's marginal revenue, as a function of its own quantity and the quantity produced by the other firm: $MR_A(q_A,q_B)$. [Hint: $MR_A = dTR_A / dq_A$.]

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

d. Assume the equilibrium is symmetric (that is, assume $q_A^* = q_B^*$) and compute Ames's equilibrium quantity q_A^*.

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.

Price

Quantity

(4) [Joint profit maximization: 10 pts] Suppose the two firms in the previous problem form a cartel to maximize the sum of their profits. Show your work and circle your final answers.

a. Find the cartel's marginal revenue function.

b. Compute the cartel's profit-maximizing level of output Q*.

c. Compute the cartel's profit-maximizing price P*.

d. Compute the cartel's Lerner index of market power [(P-MC)/P].

e. Compute the social deadweight loss from the cartel.

(5) [Measures of concentration: 6 pts] The U.S. Bureau of Transportation Statistics reported that shares in the U.S. airline domestic market in 2017 were as follows.

Airline	Market share
American	18%
Southwest	18%
Delta	17%
United	15%
JetBlue	6%
Alaska	5%
Spirit	3%
Frontier	3%
SkyWest	3%
Hawaiian	2%

The total sums to 90%. Assume the remaining carriers are very small and may be ignored in the following calculations.

a. Compute the four-firm concentration ratio.   %

b. Compute the eight-firm concentration ratio.   %

c. Compute the Hirschman-Herfindahl Index.

(6) [Equilibrium entry: 19 pts] Suppose annual demand for screwdrivers is given by **P = 25 – (Q/10),** marginal and average cost is **$1**, and the market is a symmetric Cournot oligopoly. It can be shown that the equilibrium market quantity depends on the number of firms as follows.

Number of firms	Equilibrium market quantity	Equilibrium market price	Quantity per firm	Annual profit per firm	PDV profit per firm
1	120	$	120	$	$
2	160	$	80	$	$
3	180	$	60	$	$
4	192	$	48	$	$
5	200	$	40	$	$

a. Compute the equilibrium market price as the number of firms ranges from 1 through 5. Insert your answers in the table above.

b. Compute the annual profit per firm as the number of firms ranges from 1 through 5. Insert your answers in the table above.

c. Suppose this annual profit continues indefinitely and the firms' discount rate is **10%**. Compute the present discounted value of profit per firm as the number of firms ranges from 1 through 5. Insert your answers in the table above. [Hint: The present discounted value of a perpetual annual payment of X at discount rate r is given by X/r.]

d. [2 pts] What is the equilibrium number of firms in this industry when the upfront cost of entry is $5000?

e. [2 pts] What is the equilibrium number of firms in this industry when the upfront cost of entry is $2000?

(7) [Entry barriers and contestable markets: 26 pts] The graph below shows a market where the incumbent firm now produces eight million units of output and sets a price of $6. The average cost curve applies to the incumbent and to any other firm that tries to enter this market.
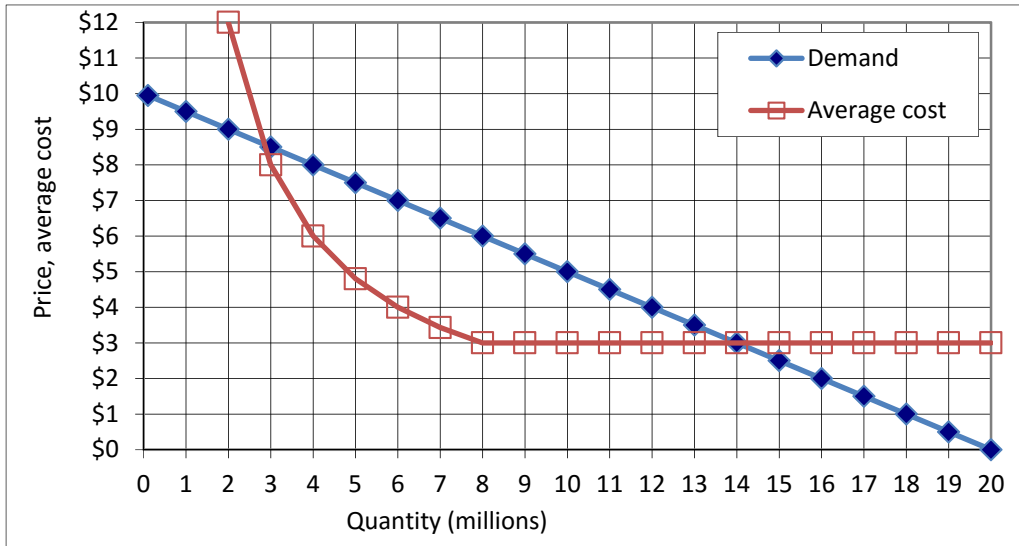
a. What is minimum average cost?

$

b. What is the minimum efficient scale?

million

c. Assume MC=AC and compute the incumbent's Lerner index (or "price-cost margin").

First, suppose a second firm enters the market and produces four million units of output. Assume the Bain-Sylos postulate: the incumbent firm keeps its output level fixed at eight million and lets the market price fall.

d. What is the new market price?

$

e. What is the entrant's average cost?

$

f. Does the entrant make a profit or a loss?

g. How much?

$ million

Alternatively, suppose a second firm enters the market and offers a price of $5. Do not assume the Bain-Sylos postulate. Instead assume the market is *contestable* and the incumbent firm keeps its price fixed at $6.

h. What is the entrant's quantity?

million

i. What is the entrant's average cost?

$

j. Does the entrant make a profit or a loss?

k. How much?

$ million

l. What price *should* the incumbent set to prevent entry?

$

m. Compute the incumbent's Lerner index (or "price-cost margin") assuming it sets price as in part (l).

III. Critical thinking: Write a one-paragraph essay answering *just one* question below (your choice). Full credit requires correct economic reasoning, legible writing, good grammar including complete sentences, and accurate spelling. [4 pts]

(1) Reconsider problem (4). Cartels are illegal in the United States, with a few exceptions legislated by Congress. What is the maximum amount of money the two firms would pay Congress for an exception? Justify your answer.

(2) Suppose there are two firms in the market for pizzas, Amy's Pizza and Barney's Pizza, 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 Amy's Pizza has chosen a price of $10.
   a. What price is Barney's best reply to Amy's initial price? Why?
   b. What price is Amy's best reply to Barney's price (from part (a))? Why?
   c. What is the Nash equilibrium of this game? Why?

[end of exam]