

FINAL EXAMINATION VERSION A

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. Maximum total points are 200.

I. Multiple choice: Please circle the one best answer to each question. [2 pts each, 48 pts total]

- (1) Monopoly causes economic inefficiency because
- monopoly prices are unfair.
 - it is unfair for one firm to control the market.
 - monopolists are usually wealthier than their customers.
 - some consumers, willing to pay the marginal cost of the product, are not served.
 - monopolists enjoy profits, called monopoly rents, even in the long run.
- (2) An action by a firm that is *per se* illegal
- is always illegal regardless of circumstances.
 - may be illegal if it appears to lessen competition.
 - may be illegal if it increases the firm's profit.
 - may be illegal if it decreases other firms' profits.
- (3) Which market model predicts the highest equilibrium price?
- Price competition.
 - Collusion to maximize joint profits.
 - Cournot oligopoly.
 - All models predict the same equilibrium price, if all use the same assumptions about market demand and marginal cost.
- (4) Under U.S. law, price-fixing is illegal
- if total market quantity is reduced significantly below the competitive quantity.
 - if significant deadweight loss can be shown.
 - if price is raised significantly above marginal cost.
 - per se*, except in industries Congress has exempted.
- (5) Which hypothesis claims that higher industry concentration is *not* associated with a loss of social welfare?
- collusion hypothesis.
 - differential efficiency hypothesis.
 - Both of the above.
 - None of the above.
- (6) Which type of merger is most likely to be opposed by the government today?
- a conglomerate merger for product extension.
 - a conglomerate merger for market extension.
 - a pure conglomerate merger.
 - a horizontal merger.
 - a vertical merger.
 - all of the above are equally likely to be opposed.
- (7) Examples of vertical restraints do *not* include
- tying.
 - predatory pricing.
 - territorial restraints.
 - exclusive dealing.
 - resale price maintenance.
- (8) Predatory pricing can be profitable only if predation is followed by a period of
- competition.
 - recoupment.
 - price discrimination.
 - accommodation.
 - losses.
- (9) According to the Areeda-Turner (1975) rule, a firm should be presumed to be engaging in predatory pricing if its price is less than its
- average total cost.
 - marginal cost
 - average variable cost.
 - average fixed cost.

(10) Most observers agree that the task for antitrust in the new economy is

- a. to prevent markets from becoming too concentrated.
- b. to ensure that prices are close to marginal cost.
- c. to prevent dominant firms from stifling challenges by new entrants.
- d. to minimize disruption to markets.
- e. all of the above.

(11) The principle that the government may regulate any industry "affected with a public interest" was established by the Supreme Court in the case of

- a. *Nebbia v. New York*.
- b. *Smyth v. Ames*.
- c. *Munn v. Illinois*.
- d. *Standard Oil v. United States*.

(12) Regulation serves only the industry regulated according to the

- a. "normative analysis as positive theory" of regulation (also called the "public interest" theory of regulation).
- b. "capture theory" of regulation.
- c. Stigler-Peltzman theory of regulation.
- d. Becker theory of regulation.

(13) Social deadweight loss is minimized when price is set equal to

- a. marginal cost.
- b. average fixed cost.
- c. average variable cost.
- d. average total cost.

(14) The table below shows a firm's total cost for producing different combinations of outputs. Does this firm enjoy *economies of scope*?

- a. Yes.
- b. No.
- c. Cannot be determined from information given.

Output	Total cost
1000 brooms	\$5000
500 mops	\$2000
1000 brooms and 500 mops	\$6000

(15) In Ramsey pricing, as in market-segmenting price discrimination, the market segment with more-elastic demand gets

- a. the smaller price-cost margin.
- b. the larger price-cost margin.
- c. the same price-cost margin, assuming marginal costs are identical.
- d. cannot be determined from information given.

(16) The *rate base* for a regulated public utility is

- a. the number of customers it serves.
- b. the minimum usage price it may charge.
- c. the value of its plant and equipment.
- d. the monthly service fee for its lowest-price customers.

(17) According to Kahn's definition, the cost of an input that can be used to produce either of several outputs, but with a tradeoff, is called

- a. an average cost.
- b. a fixed cost.
- c. a common cost.
- d. a joint cost.
- e. a fully-distributed cost.

(18) Retail markets for electricity are regulated by

- a. local governments.
- b. state utility commissions.
- c. the Federal Trade Commission.
- d. the Federal Energy Regulatory Commission.

(19) Assume that in some wholesale electricity market, all producers are paid the same equilibrium price, and that no firm has the ability to manipulate the final price. Then each firm's optimal bid is

- a. greater than its true marginal cost.
- b. less than its true marginal cost.
- c. equal to its true marginal cost.
- d. zero.

(20) Even if a wholesale electricity market is functioning perfectly, the price of electricity may be higher in one location than others if

- a. that location has fewer generators than others.
- b. that location has greater demand for electricity than others.
- c. transmission lines going into that location are at maximum safe capacity.
- d. that location does not use peak-load pricing for retail customers.

(21) Which industry was regulated first in the United States?

- a. Railroads.
- b. Trucking.
- c. Airlines.
- d. All three industries were regulated simultaneously.

(22) One group that was harmed by deregulation of trucking was

- a. shippers.
- b. consumers.
- c. unionized truck drivers.
- d. all of the above.

(23) From 1938 when the Civil Aeronautics Board was created to 1978 when the Airline Deregulation Act was passed, the CAB received 79 applications for new trunk airlines. How many applications were approved?

- a. 0.
- b. 5.
- c. 12.
- d. 39.
- e. 79.

(24) After airline deregulation, fares *fell* for

- a. short-haul routes (less than 500 miles).
- b. long-haul routes (more than 1000 miles).
- c. all routes.
- d. no routes.

II. Problems: 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] Frosty Ice Rink enjoys a local monopoly. Its marginal cost per customer is \$6.00. The management believes the elasticity of demand for admission is -4.

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

\$	

b. Compute Frosty’s Lerner index of market power [$(P-MC)/P$].

(2) [Antitrust statutes: 8 pts] Insert one of the following statutes in each box. You may insert the same statute into more than one box.

Sherman Act Section 1
Clayton Act Section 7

Sherman Act Section 2
Federal Trade Commission Act Section 5

- 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. “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.”
- 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. “Unfair methods of competition in or affecting commerce, and unfair or deceptive acts or practices in or affecting commerce, are declared unlawful.”

(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 $P = 14 - (Q/10)$. 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 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 Acme'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 (or "price-cost margin," $(P-MC)/P$).

g. Compute the social deadweight loss from Cournot duopoly.



(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 (or "price-cost margin," $(P-MC)/P$).

e. Compute the social deadweight loss from the cartel.

(5) [HHI and merger guidelines: 12 pts] Suppose the market shares of the firms in an industry are as follows.

Firm	A	B	C	D	E	F
Market share	20%	20%	20%	20%	10%	10%

a. Compute the current value of the Hirschman-Herfindahl index.

--

b. Under the 2010 DOJ-FTC *Horizontal Merger Guidelines*, would this industry be classified as “unconcentrated,” “moderately concentrated,” or “highly concentrated”?

--

Now suppose Firm E were to merge with Firm F.

c. Compute the postmerger value of the Hirschman-Herfindahl index.

--

d. Under the 2010 *Guidelines*, would this industry now be classified as “unconcentrated,” “moderately concentrated,” or “highly concentrated”?

--

e. On the basis of these calculations alone, under the 2010 *Guidelines*, would this merger be deemed “**unlikely to have adverse competitive effects**,” or would it “**raise significant competitive concerns**,” or would it be “**presumed to be likely to enhance market power**”? Why?

--

(6) [Upward pricing pressure: 8 pts] Suppose Firm A has 40% market share and Firm B has 20% market share. Assume that all customers buy from *some* firm in this market.

a. Compute an estimate of the diversion ratio D_{AB} —that is, the number of units lost by Firm B when Firm A sells one more unit.

--

b. Compute an estimate of the diversion ratio D_{BA} —that is, the number of units lost by Firm A when Firm B sells one more unit.

--

Further assume the following.

- Firm A’s price and marginal cost are \$21 and \$17 respectively.
- Firm B’s price and marginal cost are \$23 and \$14, respectively.
- It is estimated that a merger would lower Firm A’s marginal cost to \$16, and would lower Firm B’s marginal cost to \$13.

Suppose Firms A and B were to merge. Compute the consequences for **Firm A’s pricing**.

c. Compute the upward pricing pressure on Firm A caused by the merger (UPP_A).

\$

d. Compute the hypothetical value of efficiencies (that is, the decrease in Firm A’s marginal cost) that would be required to reduce UPP_A to zero.

\$

(7) [Successive monopolies with fixed proportions: 18 pts] Suppose an upstream monopoly firm produces a component that is used by a downstream firm to make a particular appliance. The upstream firm has constant marginal cost (equal to average cost) of $MC_C = \$1$. Each appliance requires exactly one component and \$3 of other inputs in fixed proportion. Therefore the downstream firm has constant marginal cost (equal to average cost) of \$3 plus the price of the component, P_C , which is set by the upstream firm. The key assumptions are

Marginal and average cost of component:	$MC_C = AC_C = \$1.$
Marginal and average cost of appliance:	$MC_A = AC_A = \$3 + P_C$
Demand for appliance:	$P_A = 8 - (Q/10).$

- a. [2 pts] Find the equation for the marginal revenue curve for the appliance. [Hint: If demand is linear, marginal revenue has the same vertical intercept, but twice the slope, as the demand curve.]

$MR_A =$

Now compare market outcomes under two scenarios: (i) upstream and downstream markets are both monopolized, and (ii) upstream and downstream are served by a vertically-integrated monopoly.

(i) First suppose both upstream and downstream markets are both monopolized. This is the scenario of "successive monopolies" or "double marginalization."

- b. [2 pts] Find the equation for the derived demand curve for component. [Hint: Set the marginal cost of the appliances equal to MR_A and solve for P_C .]

$P_C =$

- c. [2 pts] Find the equation for the marginal revenue curve for component. [Hint: For linear demand curves, marginal revenue has the same vertical intercept, but twice the slope, as the demand curve.]

$MR_C =$

Now compute the quantity of component (and thus appliances) sold Q , the price of component P_C , the upstream component monopolist's profit, the price of appliances P_A , and the downstream appliance monopoly's profit. Insert your answers in column (i) in the **Table of Results** below.

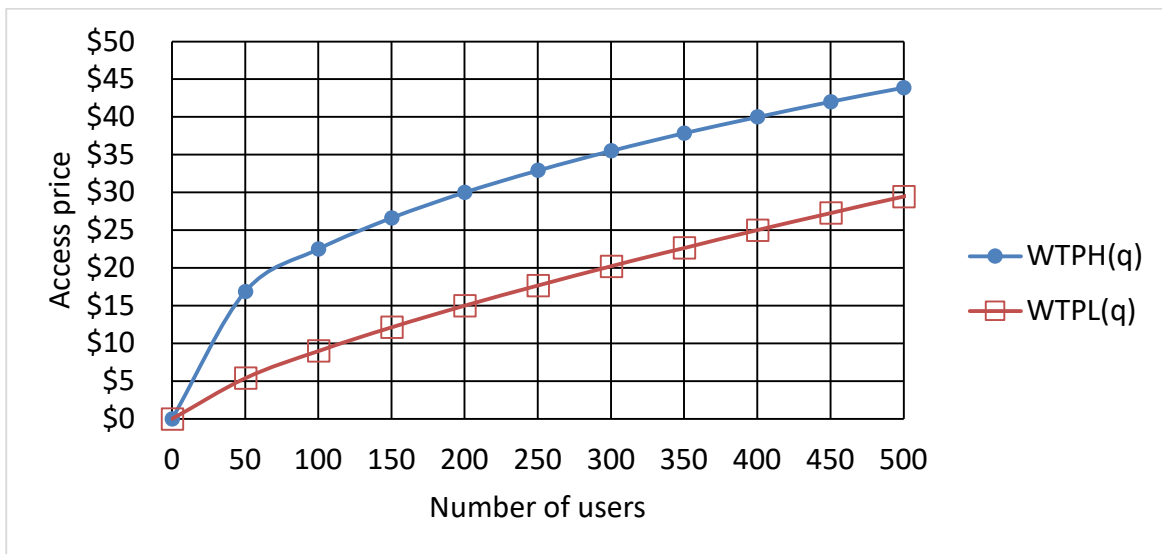
(ii) Second, assume the upstream and downstream industries are served by a vertically-integrated monopoly. The marginal cost of appliances for the vertically-integrated monopoly is therefore $MC_A = \$1 + \3 .

Now compute the quantity of appliances, the price of appliances P_A , and the integrated monopolist's profit. Insert your answers in column (ii) of the Table of Results below.

Table of Results [9 pts]	(i) Successive monopolies	(ii) Vertically integrated monopoly
Q = quantity of components (and appliances)		
P_C = price of component	\$	
Profit of upstream firm	\$	
P_A = price of appliances	\$	\$
Profit of downstream firm	\$	
Total upstream + downstream profits	\$	\$

d. [3 pts] Suppose this industry were initially organized as successive monopolies. Then suppose the upstream firm proposed to merge with the downstream firm. Should the government try to block the merger? Why or why not?

(8) [Network effects: 8 pts] The following graph shows willingness to pay for access to a network for two representative users, a high-intensity user (WTPH) and a low-intensity user (WTPL). Assume there are 200 potential users of each type.

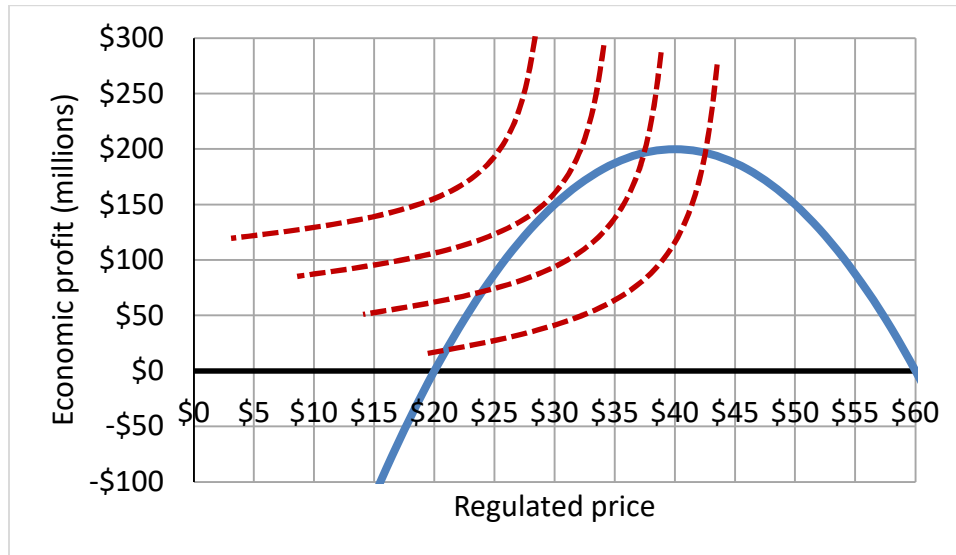


a. Explain why these curves slope upward.

- b. What range of access prices (P) would be compatible in equilibrium with **no users** on the network?
- c. What range of access prices would be compatible in equilibrium with **200 users** on the network?
- d. What range of access prices would be compatible in equilibrium with **400 users** on the network?

\$	$< P < \$$
\$	$< P < \$$
\$	$< P < \$$

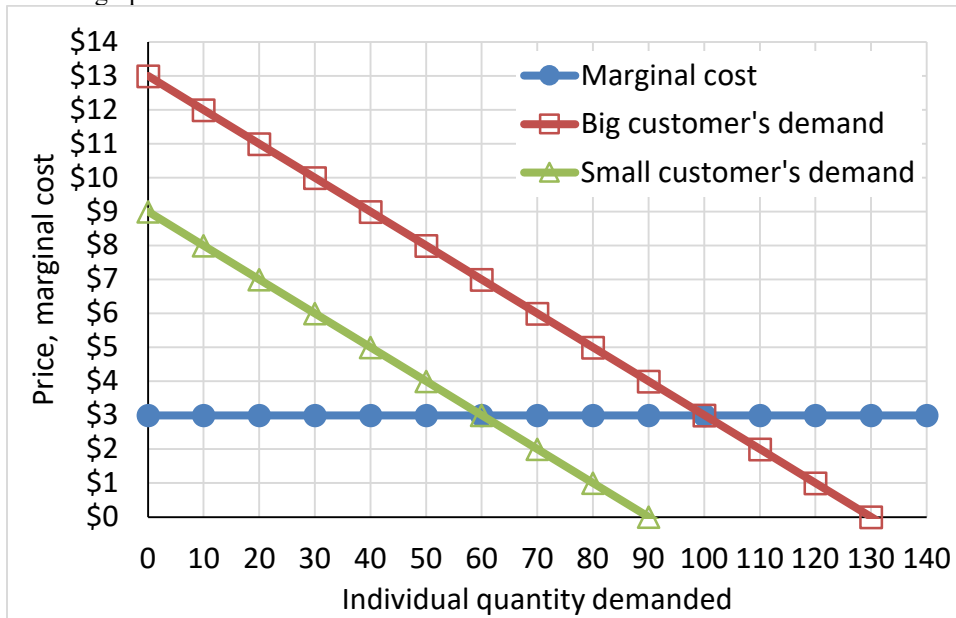
(9) [Positive theories of regulation: 6 pts] The graph below shows the economic profit function of a regulated industry as a solid curve, and the indifference curves of the regulator as dashed curves. The regulator's indifference curves slope up because the regulator gets support from consumers by keeping prices low, and gets support from the regulated industry by keeping economic profit high. Assume average cost is constant and equal to marginal cost.



- a. According to the public-interest theory of regulation, what price will the regulator set?
- b. According to the capture theory of regulation, what price will the regulator set?
- c. According to the Stigler-Peltzman theory of regulation, what price will the regulator set?

	\$
	\$
	\$

(10) [Multipart tariffs: 26 pts] Suppose a regulated firm has a marginal cost (= average variable cost) of \$ 3. In addition to the marginal cost shown in the graph below, the firm has "fixed" or overhead costs of \$ 200 million per month. The firm serves both big customers and customers. Their representative individual monthly demand curves are also shown in the graph.



Consider two alternative tariffs:

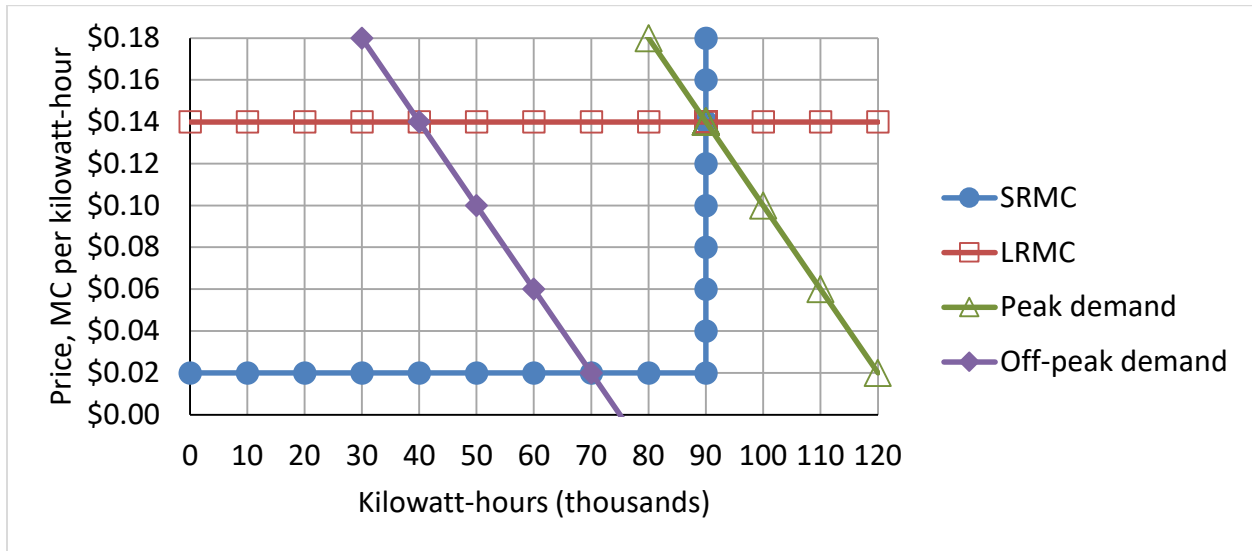
- (i) **Two-part tariff.** Each customer must pay an entry fee (or monthly charge) of \$ 100 and a per-unit usage charge of \$ 3 per unit.
- (ii) **Declining-block tariff.** Each customer must pay \$ 5 per unit for the first 60 units purchased, and \$ 3 per unit thereafter.

Assume there are one million big customers and one million small customers. Compute the following.

	(i) Two-part tariff	(ii) Declining-block tariff
a. What quantity would a typical big customer buy?	units	units
b. What quantity would a typical small customer buy?	units	units
c. Compute the firm's total revenue.	\$ million	\$ million
d. Compute the firm's total cost (including the "fixed" cost).	\$ million	\$ million
e. Does the firm make a <i>profit</i> , a <i>loss</i> , or just <i>break even</i> ?		
f. Compute the social deadweight loss from this pricing policy.	\$ million	\$ million

g. Which of these tariffs do you favor? Why?

(11) [Peak-load pricing: 22 pts] Suppose cost and demand for electricity are given by the following graph. Costs are shown as short-run marginal cost (SRMC) and long-run marginal cost (LRMC) curves. LRMC includes the cost of building new capacity. Demands are shown as peak demand and off-peak demand. Assume for simplicity that peak and off-peak periods are the only periods, and they are of equal duration.



a. Explain in words why SRMC bends up vertically at 90 thousand kilowatt hours.

First, suppose efficient peak-load pricing is used.

- b. Find the price of electricity during the peak period.
- c. Find the quantity of electricity demanded during the peak period.
- d. Find the price of electricity during the off-peak period
- e. Find the quantity of electricity demanded during the off-peak period.

\$			per kWh
			thousand kWh
\$			per kWh
			thousand kWh

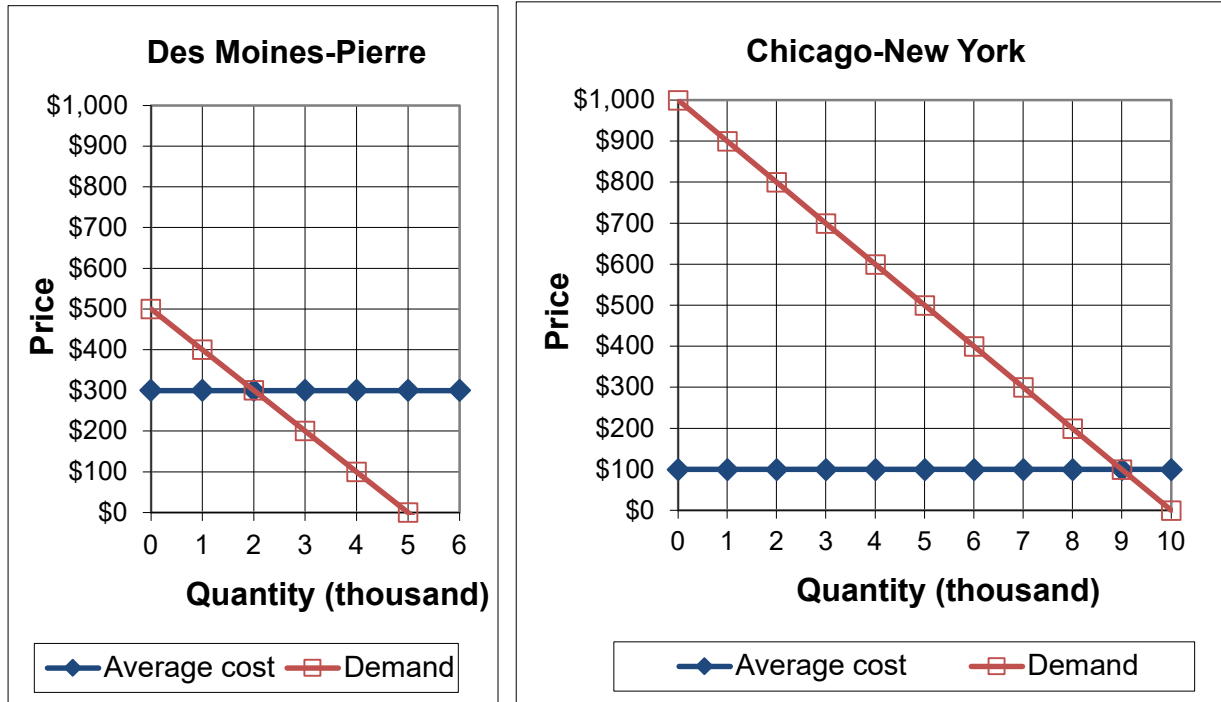
Now suppose instead a uniform price of **\$ 0.10** per kilowatt-hour is used in both peak and off-peak periods.

- f. Find the quantity of electricity demanded during the peak period.
- g. Find the quantity of electricity demanded during the off-peak period.
- h. Would generation capacity have to *increase, decrease, or stay the same* to accommodate uniform pricing?
- i. By how much?
- j. In the graph above, shade the areas representing social deadweight loss from uniform pricing.
- k. Compute the social deadweight loss from uniform pricing.

			thousand kWh
			thousand kWh
			thousand kWh

\$			thousand
----	--	--	----------

(12) [Cross-subsidization: 12 pts] The following graphs show the demands and average costs for air travel between Des Moines and Pierre, and between Chicago and New York. Assume that average cost equals marginal cost. Average cost per passenger is lower in the Chicago-New York market because larger planes can be used.



Suppose a regulated airline is required to set the airfare between Des Moines and Pierre at **\$100**.

- Compute the social deadweight loss in the Des Moines-Pierre market from this pricing policy.
- Compute the loss that the airline will experience in the Des Moines-Pierre market from this pricing policy.

\$	thousand
\$	thousand

Suppose the regulated airline is permitted to recover its loss in the Des Moines-Pierre market by raising price above average cost in the Chicago-New York market.

- What is the lowest price in the Chicago-New York market that would allow the airline to recover its loss in the Des Moines-Pierre market?
- Compute the social deadweight loss in the Chicago-New York market from this pricing policy.

\$	
\$	thousand

e. Shade both areas of deadweight loss in the graphs above.

- Compute the social loss from regulation with cross-subsidization—that is, the social deadweight loss in the Des Moines-Pierre market plus the social deadweight loss in the Chicago-New York market.

\$	thousand
----	----------

III. Critical thinking: Write a one-paragraph essay answering *one* question below (your choice). [4 pts]

- (1) Bridges are expensive to construct, so often governments raise the money to pay for bridge construction through tolls. In big cities, bridges are intensively used on weekdays (Monday-Friday) but only lightly used on weekends (Saturday-Sunday).
 - a. Are bridges a *joint cost* or a *common cost*ⁱ for weekday traffic and weekend traffic? Why? Justify your answer.
 - b. Assume that the government wants to set tolls so that price equals marginal cost. Should the cost of bridge construction be included in weekday tolls only, in weekend tolls only, or both? Why?

- (2) In the electric power industry, some utilities are vertically integrated and some are not. Vertically-integrated utilities own power generation facilities as well as distribution networks to retail customers. Non-vertically-integrated utilities do not own power generation facilities. Which type of firm is subject to greater risk from fluctuations in the price of wholesale electric power? Why?

Please circle the question you are answering. Write your answer below. Full credit requires correct economic reasoning, legible writing, good grammar including complete sentences, and accurate spelling.

[end of exam]

ⁱ Use Kahn's definitions of *common cost* and *joint cost*. Alfred E. Kahn, *The Economics of Regulation: Principles and Institutions*, Volume 1, New York: Wiley, 1970, pp.78-79.