FINAL EXAMINATION VERSION A
May 15, 2019

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. Maximum total points are 200.

I. Multiple choice: Please circle the one best answer to each question. [2 pts each, 32 pts total]

(1) If marginal cost is greater than marginal revenue at the current level of output, the firm can increase its profit by
a.   increasing output.
b.   decreasing output.
c.   either increasing or decreasing output.
d.   none of the above.
e.   Cannot be determined from information given.

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

(3) 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.

(4) Suppose a dominant firm shares a market with a competitive fringe of smaller firms. The dominant firm's market power is greater,
a.   the less elastic is total market demand curve.
b.   the less elastic is the competitive fringe's supply curve.
c.   Both of the above.
d.   None of the above.

(5) According to the DOJ-FTC *Horizontal Merger Guidelines*, the ability of a hypothetical monopolist to impose a "small but significant and nontransitory increase in price" should be used to
a.   compute a merged firm's Lerner index.
b.   define the extent of a market.
c.   decide whether a merger should be opposed.
d.   compare with any cost savings.
e.   regulate price in a market.
f.   distinguish vertical, horizontal, and conglomerate mergers.

(6) The view that vertical mergers are generally not a problem, because simple models show that either they are unprofitable or they do not decrease welfare, is called the
a.   Traditional or Harvard School view.
b.   Chicago School view.
c.   Post-Chicago view.
d.   Supply-side view.

(7) 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
a.   average variable cost.
b.   average fixed cost.
c.   average total cost.
d.   marginal cost

(8) Suppose a company has a patent on Product X. According to the Supreme Court in *Kodak v. Image Technical Services*, antitrust law prevents that company from
a. raising the price of Product X "unreasonably" higher than marginal cost.
b. using the patent to gain a monopoly in Product Y.
c. cross-licensing its patent with other companies holding other patents.
d. refusing to license the patent to other would-be producers of Product X.

(9) 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.

(10) 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.

(11) 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.

(12) 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.

(13) Regulation prevented *exit* from unprofitable markets in
a. railroads.
b. trucking.
c. both industries.
d. neither industry.

(14) Which industry became *less* profitable after deregulation?
a. Railroads.
b. Trucking.
c. Both industries.
d. Neither industry.

(15) Airline regulation of fares and entry had the indirect effect of increasing
a. load factors.
b. the quality of food and other amenities.
c. the average travel time to destination.
d. the total number of passengers flying.

(16) An unanticipated effect of airline regulation was
a. adoption of point-to-point route systems.
b. a shift to hub-and-spoke route systems.
c. an increase in fares for long-haul routes.
d. a fall in load factors.

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

<center>

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

</center>

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. "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."

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

(2) [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 $P = 10 - (Q/100)$. Each firm has constant marginal and average cost equal to $4. 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 Acmes'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

(3) [Price-setting (Bertrand) duopoly with differentiated products: 15 pts] Firm A and Firm B produce similar items, but their designs are distinctive, so their products are not perfect substitutes. Firm A's demand is given by $Q_A = 300 - 20 P_A + 10 P_B$. Firm B's demand is given by $Q_B = 300 - 20 P_B + 10 P_A$. Each firm sets its own *price*, taking as given the *price* of the other firm. Assume the firms have no costs, so each firm simply seeks to maximize its own revenue.

a. Give an expression for Firm A's revenue TR_A, in terms of P_A and P_B .

b. What price should Firm A set, given Firm B's price P_B ? Give an expression in terms of P_B. In other words, give Firm A's *best reply function* .

c. Compute the (Nash) equilibrium prices P_A^* and P_B^*. [Hint: you may assume this equilibrium is symmetric: $P_A^* = P_B^*$.]

d. Compute Q_A^* and Q_B^*. [Again, assume symmetry.]

e. Compute the revenue of each firm.

(4) [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.
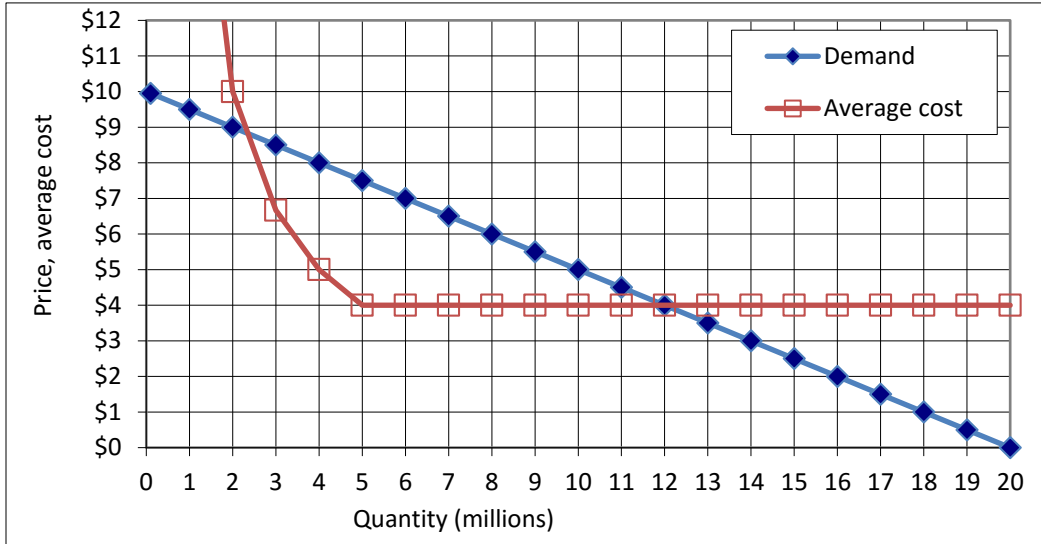
a. What is minimum average cost?

$

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).

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

Firm	A	B	C	D	E	F	G	H
Market share	20%	20%	10%	10%	10%	10%	5%	5%

Assume the shares of the remaining firms are so small that they have a negligible effect on calculations below.

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 G were to merge with Firm H.

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 50% 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 $30 and $17 respectively.
- Firm B's price and marginal cost are $20 and $15, respectively.
- It is estimated that a merger would lower Firm A's marginal cost to $16.

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 change in Firm A's marginal cost) that would be required to reduce UPP_A to zero.

$

(7) [Monopoly extension with fixed proportions: 17 pts] Suppose an upstream monopoly firm produces a patented component that is used by a downstream industry to make appliances. The upstream firm has constant marginal cost (equal to average cost) of $MC_C = \$2$. Each appliance requires exactly one component and $4 of other inputs in fixed proportion. Therefore the downstream industry has constant marginal cost (equal to average cost) of $4 plus the price of the component, P_C, which is set by the upstream monopolist. The key assumptions are

$$\text{Marginal and average cost of component:} \quad MC_C \quad = AC_C \quad = \$2.$$
$$\text{Marginal and average cost of appliance:} \quad MC_A \quad = AC_A \quad = \$4 + P_C$$
$$\text{Demand for appliance:} \quad P_A \quad = 14 - (Q/50).$$

a. [2 pts] Find the equation for the marginal revenue curve for the appliance.

> ## $MR_A =$

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

(i) First suppose the upstream market is monopolized but the downstream market is competitive, so that $P_A = MC_A = \$4 + P_C$.

b. [2 pts] Find the equation for the derived demand curve for components.

> ## $P_C =$

c. [2 pts] Find the equation for the marginal revenue curve for components.

> ## $MR_C =$

Compute the quantity of components (and thus appliances) sold Q, the price of components P_C, the upstream component monopolist's profit, the price of appliances P_A, and the downstream industry'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 $MC_A = \$4 + \$2$. 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 [8 pts]	(i) Upstream monopoly, downstream competition	(ii) Vertically integrated monopoly
Q = quantity of components (and appliances)		
P_C = price of components	$	NA
Profit of upstream firm	$	
P_A = price of appliances	$	$
Profit of downstream firm	zero	NA
Total upstream + downstream profits	$	$

d. [3 pts] Suppose this industry were initially organized as a monopoly in the upstream market but competitive in the downstream market (i). Then suppose the upstream monopoly proposed to merge with all firms in the downstream market, and thereby form a vertically integrated monopoly (ii). Would this merger be profitable? Would it harm social welfare? Explain.

(8) [Price discrimination: 6 pts] Suppose a software company believes Market Segment A has an elasticity of demand for its product equal to -1.5, and Market Segment B has an elasticity of -3. The marginal cost of delivering the software to either segment is $6.

a. Which market segment should get the higher price?

b. Compute the profit-maximizing price for Market Segment A.

$

c. Compute the profit-maximizing price for Market Segment B.

$

(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.
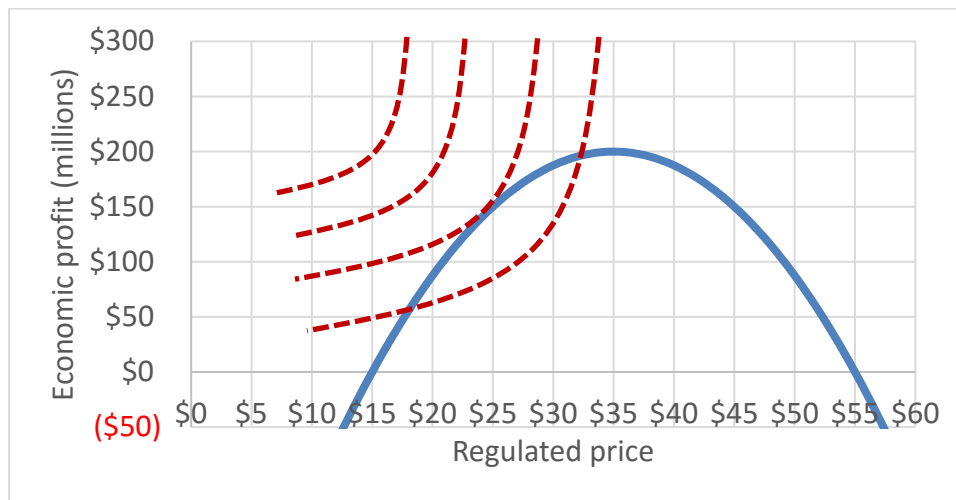
a. According to the public-interest theory of regulation, what price will the regulator set?

$

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) [Two-sided platforms: 8 pts] Suppose demand for access to a platform by two user groups is given by

User group 1 demand: $q_1 = 1000 - 10\, p_1 + 1.0\, q_2$

User group 2 demand: $q_2 = 800 - 50\, p_2$ or equivalently $p_2 = 16 - (q_2/50)$.

Note that in this case, demand by group 1 depends on the number of people from group 2 that are on the platform, but demand by group 2 does not depend on the number of people from group 1. Suppose the price for group 1 is currently set at $p_1 = \$10$ and the price for group 2 is currently set at $p_2 = \$8$. Compute the following. Show your work and circle your final answers.

a. Compute the quantities demanded by each group: q_1 and q_2 .

b. Compute the value of the marginal revenue from one more user of group 2, ignoring any revenue from the other group.

c. Compute the value of the marginal revenue from one more user of user group 2, *including* any additional revenue from group 1, and holding p_1 constant at $10.

d. Suppose the marginal cost of serving group 2 is $MC_2 = \$1$ and there is no cost of serving group 1. To increase profit, would you recommend raising or lowering the price for group 2 (p_2) ? Justify your answer.

(11) [Multipart tariffs: 26 pts] Suppose a regulated firm has a marginal cost (= average variable cost) of **$ 2**. 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 below.

Marginal cost
Big customer's demand
Small customer's demand
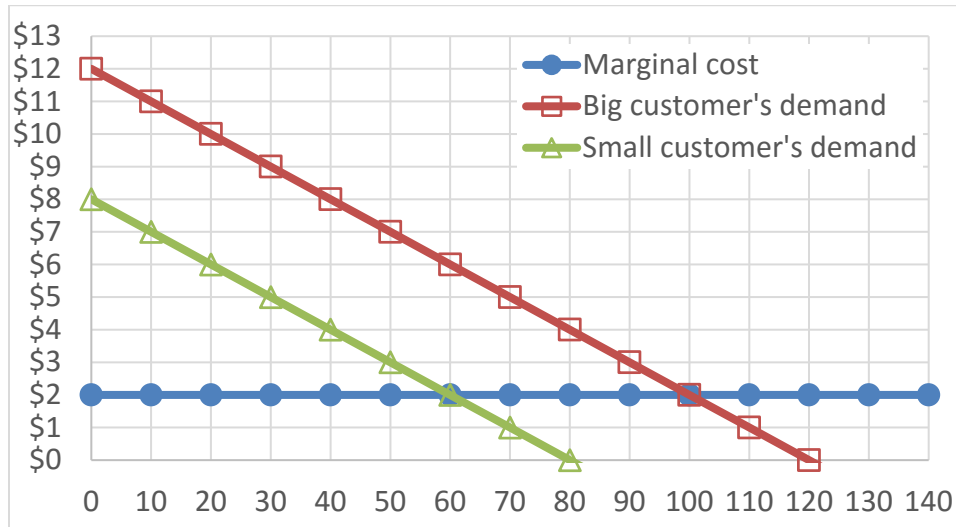
Consider two alternative tariffs:

(i)   Two-part tariff consisting of an entry fee (or monthly charge) of **$ 100** and a per-unit usage charge of **$ 2** per unit.

(ii) Declining-block tariff. Each customer must pay **$ 4** per unit for the first **60** units purchased, and **$ 2** 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 *profit*, a *loss*, or just *break even*?		
f. Compute the social deadweight loss from this pricing policy.	$ million	$ million

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

(12) [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.
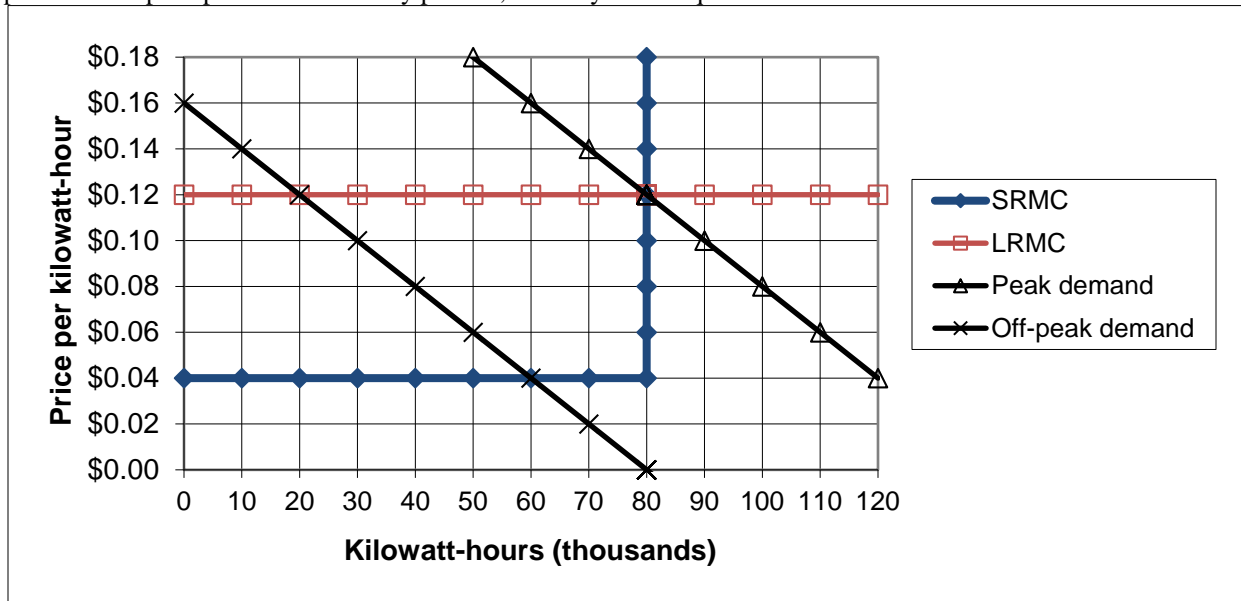
a. Explain in words why SRMC bends up vertically at 80 thousand kilowatt hours.

First, suppose efficient peak-load pricing is used.

b. Find the price of electricity during the peak period.

$ _____ per kWh

c. Find the quantity of electricity demanded during the peak period.

_____ thousand kWh

d. Find the price of electricity during the off-peak period

$ _____ per kWh

e. Find the quantity of electricity demanded during the off-peak period.

_____ 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.

_____ thousand kWh

g. Find the quantity of electricity demanded during the off-peak period.

_____ thousand kWh

h. Would generation capacity have to *increase, decrease*, or *stay the same* to accommodate uniform pricing?

i. By how much?

_____ thousand kWh

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

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) Suppose fast-food restaurants were required to charge a minimum price of at least $10 for a meal. What would happen to the quality of fast food? Why? Would consumers be better off? Why or why not?

(2) The same classrooms at Drake University are used both for regular-term courses and for summer-term courses. These classrooms are always occupied during the regular term but are mostly empty during the summer term.
   a.   Are Drake classrooms a *joint cost* or a *common cost* [i] for regular-term courses and summer-term courses? Why? Justify your answer and illustrate it with a production-possibility curve. (Label the axes.)
   b.   Assume that Drake wants to set tuition so as to price courses at marginal cost. Should the cost of classrooms be included in regular-term tuition only, in summer-term tuition only, or both? Why?
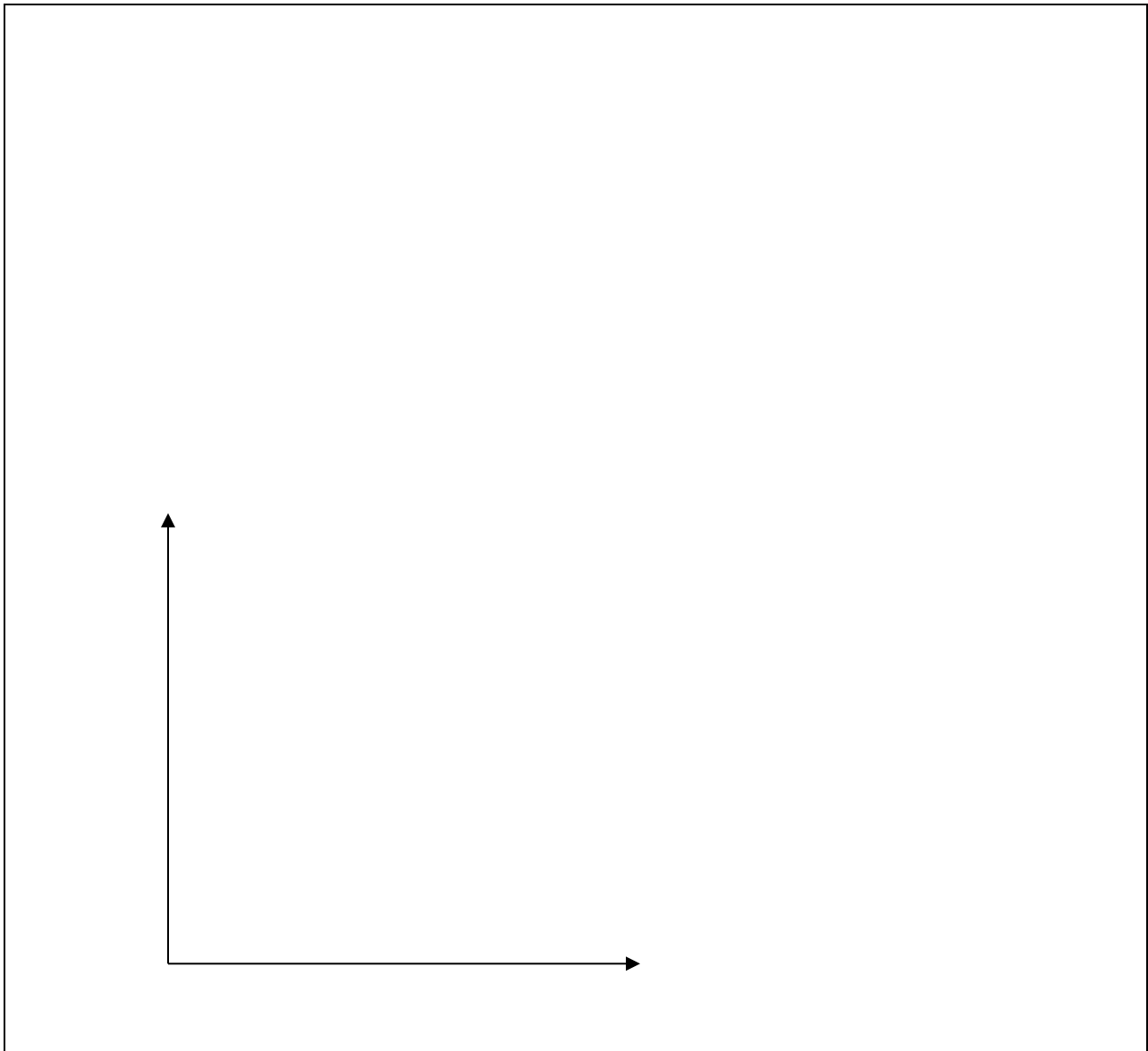
[end of exam]

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[i] Use Alfred Kahn's definitions of *common cost* and *joint cost*.