# EXAMINATION 4  VERSION B
## "Perfect and Imperfect Competition"
## April 30, 2014

INSTRUCTIONS:  This exam is closed-book, closed-notes.  Simple calculators are permitted, but graphing calculators or calculators with alphabetical keyboards are NOT permitted.  Numerical answers, if rounded, must be correct to at least 3 significant digits.  Point values for each question are noted in brackets.  Maximum total points are 100.

**I.  Multiple choice:**  Please circle the one best answer to each question.  [1 pt each, 7 pts total]

(1) Suppose the market demand elasticity for computers is -3 and Firm X has market share of 20% (or 0.2).  Then, assuming other firms do not change their market quantity, Firm X perceives an elasticity of demand for its own computers equal to
a.   -0.05.
b.   -0.15.
c.   -3.
d.   -5.
e.   -15.
f.   -60.

(2) Suppose for some reason that the quantity of gasoline sold is 30 million gallons, but the market is not in equilibrium.  Rather, at this quantity, the height of the supply curve is $5 per gallon and the height of the demand curve is $2.  Then producing one more gallon of gasoline would
a.   increase social welfare by $2.
b.   decrease social welfare by $3.
c.   increase social welfare by $5.
d.   decrease social welfare by $15.
e.   Cannot be determined without knowing the true equilibrium price.

(3) In a perfectly-competitive economy, a poor person's marginal rate of substitution between milk and orange juice is always
a.   greater than a rich person's marginal rate of substitution.
b.   less than a rich person's marginal rate of substitution.
c.   equal to a rich person's marginal rate of substitution.
d.   zero.

(4) A "natural monopoly" is a firm that enjoys
a.   an exclusive government franchise allowing it alone to sell the product.
b.   a downward-sloping average cost curve.
c.   exclusive ownership of a natural resource essential for producing the product.
d.   patent protection.

(5) Suppose a sandwich stand sells 20 sandwiches per hour if the price is $5, and sells 21 sandwiches if the price is lowered to $4.95.  The stand's marginal revenue of the 11th sandwich is therefore
a.   $0.10 .
b.   $0.20 .
c.   $0.21 .
d.   $3.95 .
e.   $4.95 .
f.   $5.00 .

(6) Suppose the bungie-cord industry has five firms, each of which has the same marginal cost, and that the market elasticity of demand is -2.  If the industry is a Cournot oligopoly, the markup of price over marginal cost (P-MC)/P must be
a.   2%.
b.   5%.
c.   10%.
d.   40%.
e.   Cannot be determined from information given.

(7) Each firm's demand curve slopes down if the firms in the industry produce
a.   perfect substitutes.
b.   inferior goods.
c.   differentiated products.
d.   identical products.

**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) [Economy-wide efficiency: 12 pts]  Suppose there are two firms in the industry producing flashlights, with the marginal cost curves and average cost curves shown in the graph below.
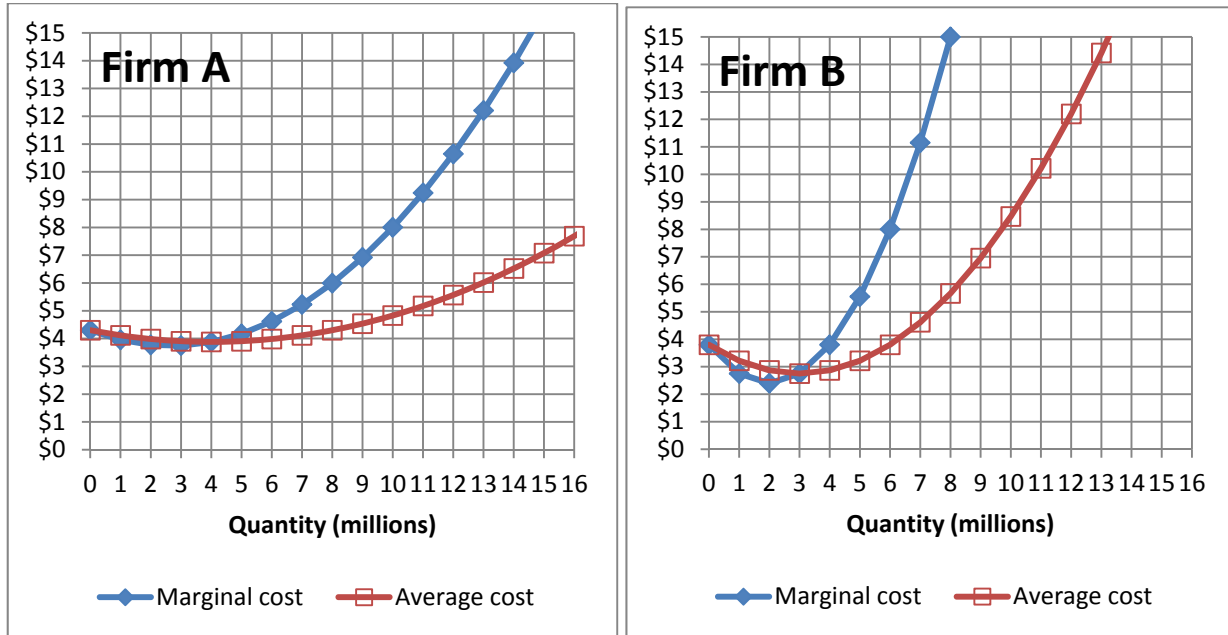


a. Suppose Firm A is currently producing **8**  million flashlights.  If Firm A increases production by one flashlight, by how much will its total cost increase?  (Give an answer to the nearest whole dollar.)

$

b. Suppose Firm B is currently producing **8**  million flashlights.  If Firm B increases production by one flashlight, by how much will its total cost increase?  (Give an answer to the nearest whole dollar.)

$

First assume the firms' output levels must be set by a government planner.  The planner wants the firms to produce a total of **16**  million flashlights, but total industry cost (that is, the combined costs for both firms) must be as low as possible.

c. Which firm should be instructed to produce more output—*Firm A* or *Firm B*, or should they produce an *equal* amount of output to make total industry cost as low as possible?

d. How much output should Firm A produce?

million

e. How much output should Firm B produce?

million

Alternatively assume there is no government planner.  Assume instead that the two firms are competitive and that they each maximize their own profit while taking price as given.

f. What price for flashlights will motivate the two firms to produce a total of **16**  million flashlights at lowest total industry cost?

$

(2) [Economy-wide efficiency: 20 pts]  The graph at right shows a country's production possibility curve.

a. What is this **country's** opportunity cost of a pound of food?

| garments |
|---|

b. What is this **country's** opportunity cost of a garment?

| pounds of food |
|---|

Assume this country's economy is in competitive equilibrium in all markets and the price of a pound of food **$ 2**.

c. What must be the marginal cost of food (per pound) for all firms producing food?

| $ |
|---|

d. What must be the price of a garment?

| $ |
|---|

e. What must be the marginal cost of clothing (per garment) for all firms producing garments?

| $ |
|---|

**Production-possibility curve**

Food (billions of pounds) vs. Clothing (billions of garments)
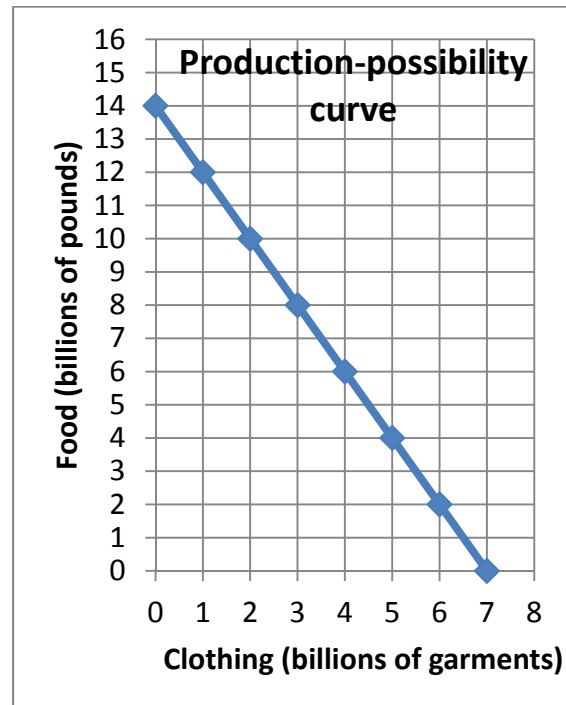
Ashley is a consumer in this economy.  She has an income of **$ 60**.

f. *Using a straightedge,* draw Ashley's budget line in the graph at right.

g. What is the slope of Ashley's budget line?

| |
|---|

h. What is **Ashley's** opportunity cost of a garment?

| pounds of food |
|---|

i. What is **Ashley's** opportunity cost of a pound of food?

| garments |
|---|

j. What is Ashley's marginal rate of substitution of clothing for food—that is, the slope of her indifference curve—at her preferred bundle on this budget line?

| |
|---|

**Budget line**

Food (pounds) vs. Clothing (garments)
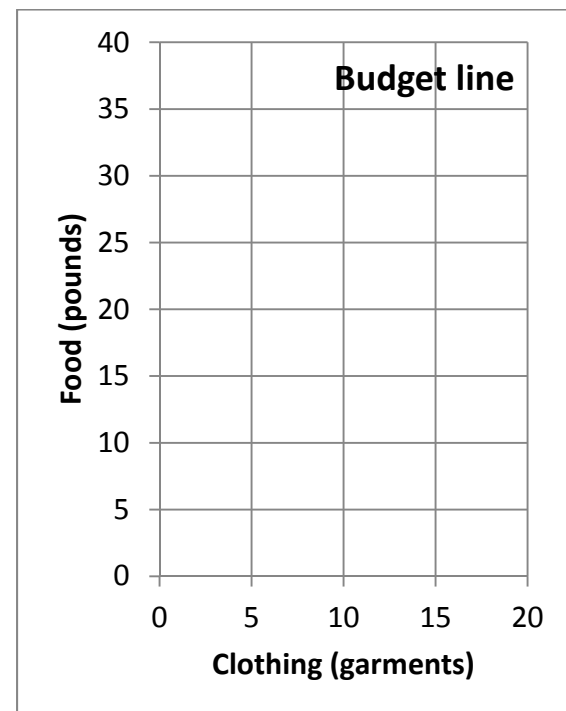
(3) [Monopoly, price discrimination: 22 pts]  Megahamburgers is the only fast-food outlet in town, so it has a monopoly.  Its marginal cost, average cost, and demand curves are shown below.
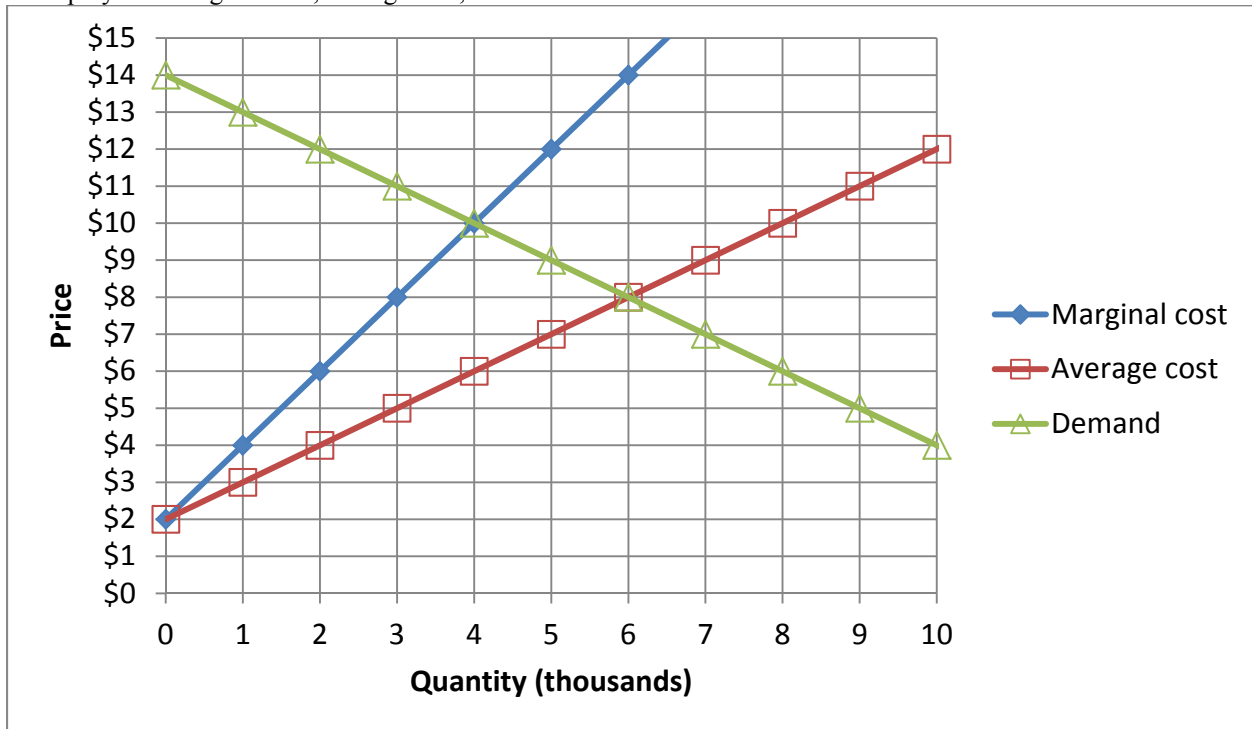


First, suppose Megahamburgers  must charge the same price on every hamburger sold.

a. *Using a straightedge*, draw and label Megahamburgers' marginal revenue curve.

b. Compute Megahamburgers' profit-maximizing quantity.

|  |  |
| --- | --- |
|  | thousand |

c. Compute the price that the Megahamburgers would charge.

|  |  |
| --- | --- |
| $ |  |

d. Compute Megahamburgers' profit.

|  |  |
| --- | --- |
| $ | thousand |

e. Compute consumer surplus

|  |  |
| --- | --- |
| $ | thousand |

f. Compute the social deadweight loss.

|  |  |
| --- | --- |
| $ | thousand |

Second, suppose Megahamburgers  can charge a different price for every hamburger sold.  In other words, suppose *perfect price discrimination* is possible, where every hamburger can be sold for the maximum price the buyer is willing to pay.

g. Compute Megahamburgers' profit-maximizing quantity.

|  |  |
| --- | --- |
|  | thousand |

h. Compute Megahamburgers' revenue.

|  |  |
| --- | --- |
| $ | thousand |

i. Compute Megahamburgers' profit.

|  |  |
| --- | --- |
| $ | thousand |

j. Compute consumer surplus.

|  |  |
| --- | --- |
| $ | thousand |

k. Compute the social deadweight loss.

|  |  |
| --- | --- |
| $ | thousand |

(4) [Competition versus collusion: 16 pts]  Suppose a small group of firms produce vitamins.  The graph below shows the demand curve for vitamins, and the joint marginal cost or supply curve of the group of firms.
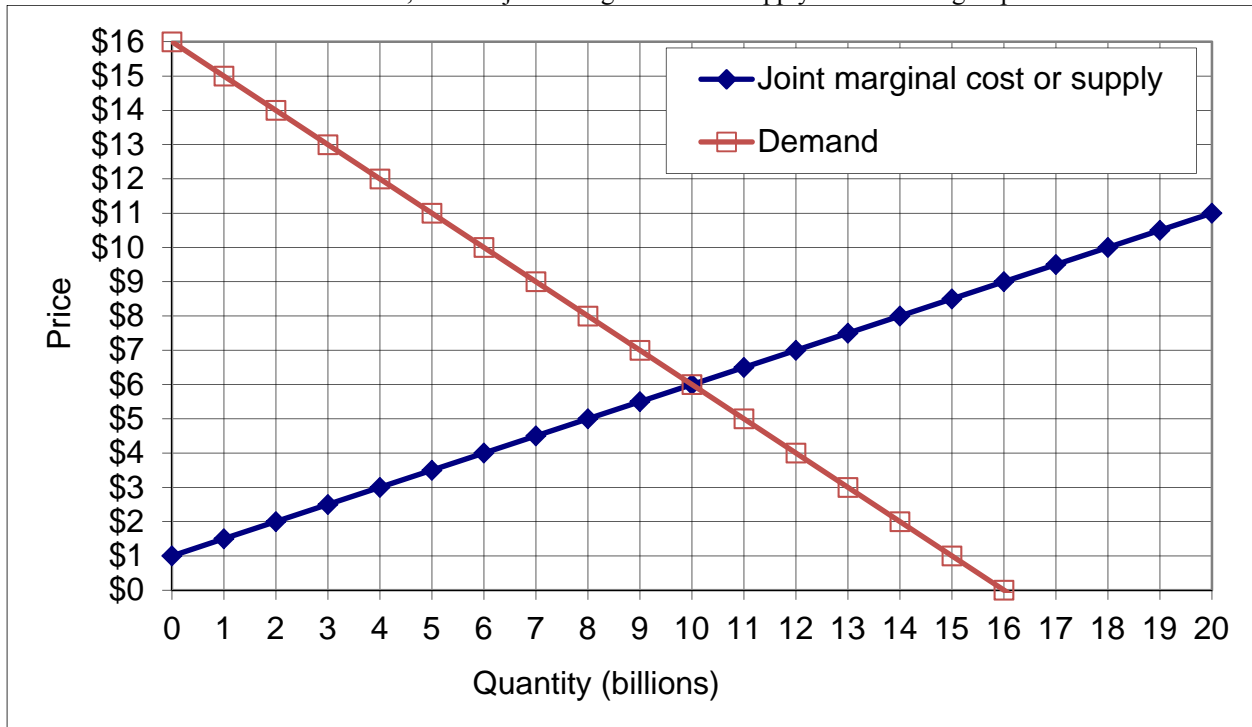


First, assume the firms *compete* with each other, each maximizing its own profit while taking the market price as given.

a. What will be the equilibrium market quantity?

| billion |
|---|

b. If output increased by one more unit at any firm, total costs would increase by how much?

| $ |
|---|

c. What will be the equilibrium market price?

| $ |
|---|

Second, alternatively assume the firms *collude* with each other, setting price jointly as a cartel to maximize the sum of their profits.

d. *Using a straightedge*, draw and label the colluding firms' marginal revenue curve.

e. What total quantity will the firms produce?

| billion |
|---|

f. If output increased by one more unit at any firm, total costs would increase by how much?

| $ |
|---|

g. What price will the firms jointly set?

| $ |
|---|

h. Compute the deadweight loss from collusion.

| $ billion |
|---|

(5) [Monopolistic competition: 12 pts]  Two convenience stores selling milk are located four miles apart on a road with customers spread between them.  Let  x  denote a particular customer's position on this road as shown in the diagram below.  Thus  x  is the distance in miles from that customer to Al's Store, and (4-x) is the distance to Bob's Store.
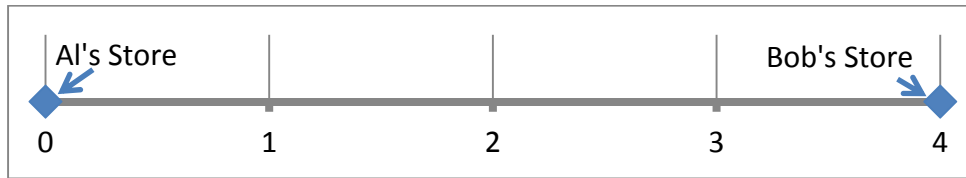


Assume each customer wants to buy one gallon of milk but dislikes driving.  In particular, each customer perceives a cost of $0.25 per mile (for gasoline, time wasted, etc.) for driving.  So each customer perceives the total price of milk from Al's Store as  $P_A{}^* = P_A + 0.25x$ , and the total price of milk from Bob's store as  $P_B{}^* = P_B + 0.25(4-x)$, where  $P_A$  and  $P_B$  denote the actual prices of milk charged at the cash register.  Naturally, each customer buys milk from the store with the lowest perceived total price.

Further assume that 500 customers per mile live along this road.  Given these assumptions, it can be shown* that the number of customers choosing to buy one gallon of milk from Al's Store is  $Q_A = 1000 (P_B - P_A + 1)$.  This can be rearranged to give the demand equation $\boxed{P_A = P_B + 1 - (Q_A/1000)}$.  Al's marginal cost of milk is **$2** per gallon.

First, assume Bob's Store sets a price of $2.50 per gallon of milk.
    a. Find the equation for Al's marginal revenue curve.  (The only variable should be $Q_A$).

$$MR =$$

    b. Compute the quantity of milk  $Q_A$  that Al's Store should try to sell to maximize profit. | gallons

    c. Compute the price  $P_A$  Al's Store should set for milk. | $

Second, assume Bob's Store sets a price of $4.00 per gallon of milk.
    d. Find the new equation for Al's marginal revenue curve.  (The only variable should be $Q_A$).

$$MR =$$

    e. Compute the new quantity of milk  $Q_A$  that Al's Store should try to sell to maximize profit. | gallons

    f. Compute the new price  $P_A$  Al's Store should set for milk. | $

  * Two points extra credit:  prove that the number of customers choosing to buy one gallon of milk from Al's Store is  $Q_A = 1000 (P_B - P_A + 1)$.

(6) [Monopoly price discrimination: 8 pts]  Wildride Amusement Park sells tickets to both children and adults.  The park believes the elasticity of demand by children is –7, and the elasticity of demand by adults is –1.5.

   a. If the price is increased by 4%, what will be the approximate decrease in tickets sold to children?

| | % |
|---|---|

   b. If the price is increased by 4%, what will be the approximate decrease in tickets sold to adults?
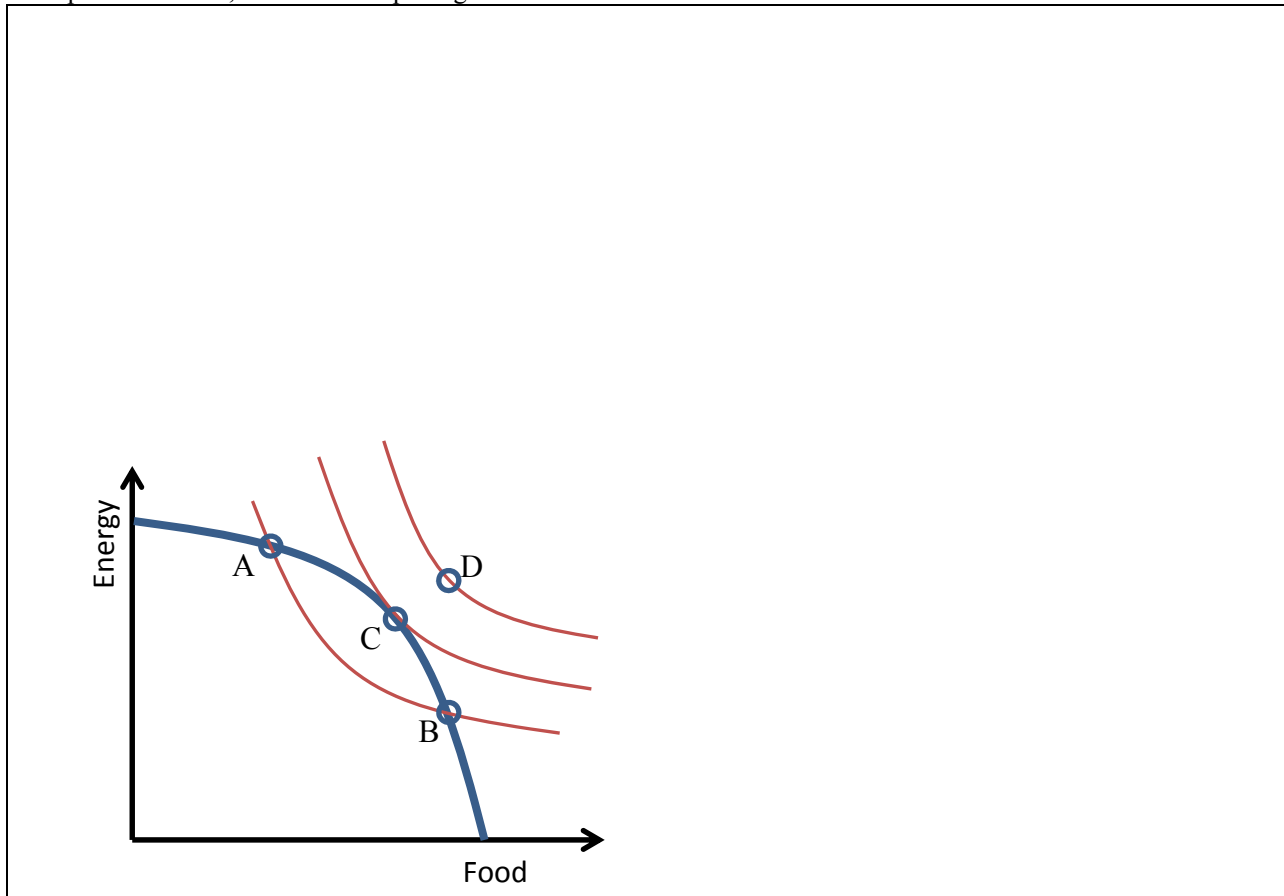
| | % |
|---|---|

Assume the marginal cost of a ticket is $12.

   c. Compute the profit-maximizing ticket price for children.

| $ | |
|---|---|

   d. Compute the profit-maximizing ticket price for adults.

| $ | |
|---|---|

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**III.  Critical thinking:**  Write a one-paragraph essay answering the question below.  [3 pts]

(1)  The graph below describes the economy of Fredonia.  The thick curve is Fredonia's production possibility curve and the thin curves are indifference curves for a representative consumer.  The market for food is competitive, but the market for energy is a monopoly.  Where is Fredonia's economy—point A, B, C, or D?  Why?

Write your answer below.  Full credit requires correct economic reasoning, legible writing, good grammar including complete sentences, and accurate spelling.



[end of exam]