Commerce 295 – Midterm Answers

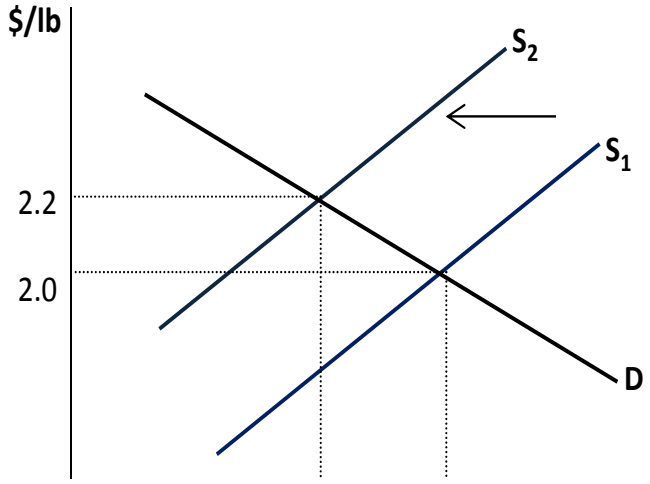
October 27, 2010

PART I

MULTIPLE CHOICE QUESTIONS

Each question has one correct response. Please circle the letter in front of the correct response for each question. There are 20 questions. Each question is worth 2 pts.

1. Consider the following diagram illustrating supply and demand in the avocado market.



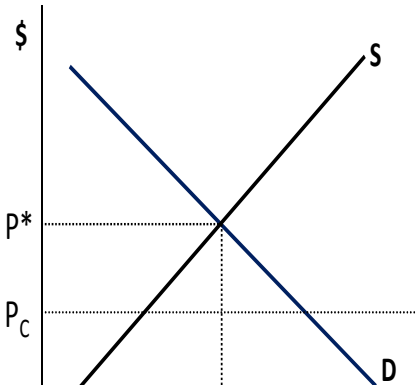
Which of the following phenomena is consistent with this diagram?

a) An increase in the income of consumers.
b) An increase in the price of a substitute good.
c) An increase in the price of a complementary good.
d) A per unit tax on avocados paid by producers.

2. Data collected from Vancouver in 2010 shows that when the price of computers increased by 25%, the quantity of computers sold decreased by 10% and the quantity of software sold decreased by 50%. What is the cross-price elasticity of demand indicating the effect of an increase in the price of computers on demand for software?

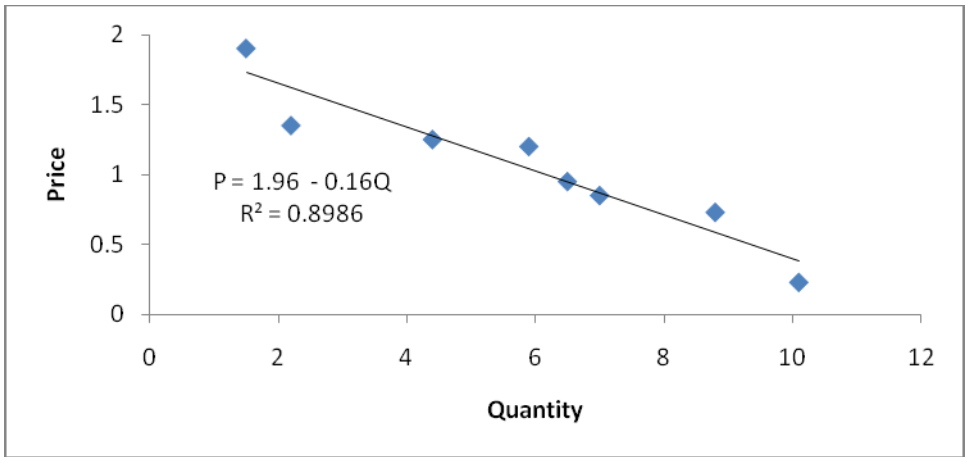
a) - 0.5.
b) 2.5.
c) - 2.0.
d) 3.0.

3. Assume a market for gasoline as shown in the following diagram. If the government sets a price ceiling at P_C (at a level lower than the free market equilibrium price P*), then



a) all consumers gain.
b) some consumers gain and some others lose.
c) producers always lose.
d) b) and c).

4. Excel was used to estimate a demand curve using data obtained from the Portland fish exchange. The output looks as follows. Quantity is measured in thousands of pounds per day and price is measured in dollars.



Which of the following statements is true?

a) The estimated (inverse) demand curve has a slope of -0.16 and a vertical intercept of 1.96.
b) Approximately 90% of the observed variation in price is explained by the regression.
c) Both a) and b) are correct.
d) None of the above.

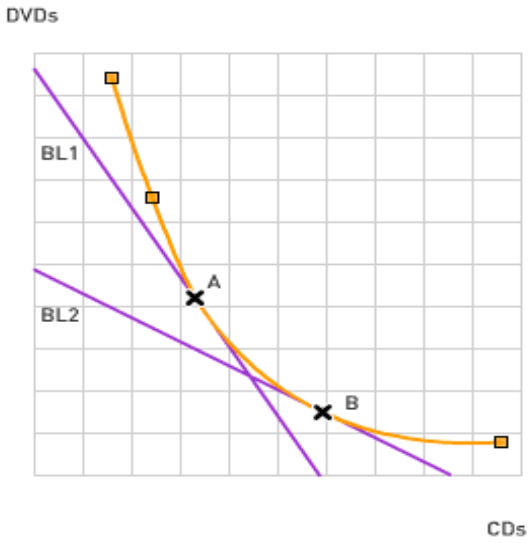
5. Consider a good whose own price elasticity of demand is zero and whose price elasticity of supply is unity (one). The fraction of a specific tax that will be passed through to consumers is:

a) 0.00.
b) 0.25.
c) 0.50.
d) 1.00.

6. Sandra lives in Richmond, BC and loves to eat dessert. She spends her entire income on pudding and yoghurt. The price of a bowl of pudding is $2 and that of yoghurt is $4. At her current consumption point, Sandra's marginal rate of substitution (MRS) of pudding for yoghurt is 1/4; this means that Sandra is willing to trade 1/4 bowls of pudding for a bowl of yoghurt. In this case which of the following statements is true?

a) Sandra could increase her utility by buying more pudding and less yoghurt.
b) Sandra could increase her utility by buying more yoghurt and less pudding.
c) Sandra's current consumption bundle maximizes her utility.
d) Sandra could maximize her utility by trading 2 bowls of pudding for a bowl of yoghurt.

7. In the figure below, a consumer maximizes utility at Point A subject to the budget constraint given by BL1. Assuming that the price of DVDs does not change, which one of the following events can cause the consumer to move from Point A to Point B?



a) A decrease in the price of CDs and a decrease in the consumer's income.
b) An increase in the price of CDs and a decrease in the consumer's income.
c) A decrease in the price of CDs and an increase in the consumer's income.
d) An increase in the price of CDs and an increase in the consumer's income.

8. Suppose that the shrimp industry in Canada is in a long-run competitive equilibrium. If Health Canada issues a report saying that eating shrimp is good for your health and as a result the market demand curve for shrimp shifts to the right, how will firms respond to this shift in demand in the short run?

a) produce the same amount of shrimp as before.
b) produce more shrimps and earn positive profits.
c) enter the industry.
d) produce more shrimps and earn zero profits.

9. Assume that the market for CDs is perfectly competitive and that each firm has a cost function given by $C = 10+ 2q^2$. In the short run the price range that would induce a typical firm to produce a positive output level is

a) any price above $10.
b) any price above $ 4.
c) any price above $2.
d) any price above zero.

10. Suppose the production function for a firm is $Q = 4L + 6K$ where L denotes units of labour, K denotes units of capital and Q denotes units of output.

a) The isoquants for this production function are convex.
b) The production function has a diminishing marginal product of labour.
c) The firm can maintain the same level of production if 4 units of K are substituted for 6 units of L.
d) The average product of labour is less than the marginal product of labour.

11. Consider the production function $Q = 10LK$ where L denotes units of labour, K denotes units of capital and Q denotes units of output.

a) The marginal rate of technical substitution will change as L is increased in value.
b) With this production function 100 units of Q can be produced with 10 units of L and 10 units of K.
c) This production function has constant returns to scale.
d) None of the above.

12. Which of the following statements is true?

a) In the short run when capital is fixed, an increasing marginal product of labour implies an increasing marginal cost of production.
b) Economies of scale are present when the long run average cost curve is increasing with higher Q.
c) If the cost function is $C(Q) = 4Q^2 + 100$ then marginal cost is greater than average variable cost for $Q > 0$.
d) In the short run an increase in property taxes will raise the marginal cost of production.

13. Which of the following statements is true?

a) When considering which job to take after graduation, a graduating student who seeks to maximize utility should ignore the cost of his or her education.

a) A firm's average total cost curve does not reflect any of the firm's opportunity costs.

b) Sunk costs should be used to calculate economic profit in the long run but not in the short run.

c) Fixed costs change as output changes when costs are not sunk.

14. Consider the following statements about pricing with market power.

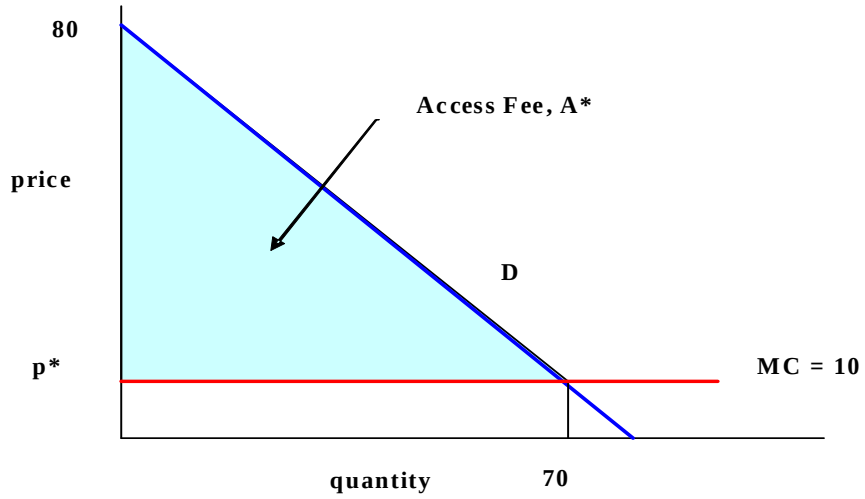
a) To maximize profits, the firm should set price to ensure that the ratio of price and marginal cost is equal to the inverse of the demand elasticity.

b) To maximize profit the firm should produce in the inelastic portion of the demand curve.

c) A monopolist will raise its price to regain lost profits if it faces an increase in fixed costs.

d) None of the above.

15. The following diagram applies to two-part pricing by a monopoly firm with identical consumers. Each consumer has the demand curve shown. There are no fixed costs and marginal cost is constant at 10. The firm maximizes profit by charging access fee A* as shown.



a) The profit-maximizing per unit fee (or usage fee) exceeds 10.

b) The firm earns profits exceeding 2400 per consumer.

c) The firm's market power leads to a deadweight loss (inefficiency).

d) None of the above.

16. The following table shows the willingness to pay (reservation prices) of four consumers for a word processor and a spreadsheet. These products are offered by a profit-maximizing monopoly firm. Assume costs are zero.

	WP	Spreadsheet
Consumer A	120	30
Consumer B	110	90
Consumer C	90	110
Consumer D	30	120

a) These consumers have negatively correlated reservation prices.
b) These consumers have uncorrelated reservation prices.
c) These consumers have positively correlated reservation prices.
d) The correlation structure of reservation prices cannot be determined with the data given.

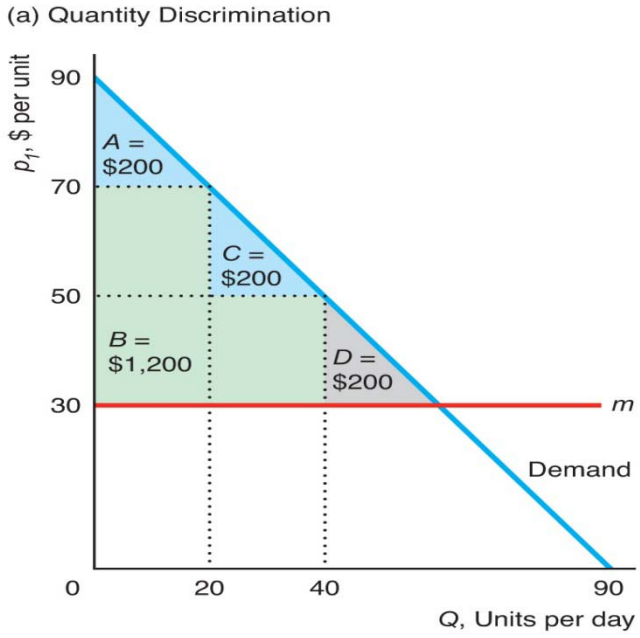
17. Use the same data as in the previous question (repeated below) to answer this question. As before the producer is a profit-maximizing monopoly firm and you should assume costs are zero.

	WP	Spreadsheet
Consumer A	120	30
Consumer B	110	90
Consumer C	90	110
Consumer D	30	120

a) Stand-alone uniform pricing yields a maximum profit of less than 500.
b) Mixed bundling yields a profit exceeding 620.
c) Pure bundling yields a profit exceeding 600.
d) None of the above.

18. A monopoly firm faces a demand curve given by $P = 50 - 5Q$, constant marginal cost of 10 and fixed costs of 40.
a) Under uniform monopoly pricing profit is 80.
b) The arc price elasticity of demand for change in price from 8 to 6 has an absolute value exceeding 0.5.
c) Under perfect (first degree) price discrimination profit is 120.
d) b) and c).

19. The following diagram relates to quantity-based price discrimination by a monopoly firm facing identical consumers. Each consumer has the demand curve shown. The equation for this demand curve is P = 90 – Q. The firm charges 70 per unit for the first 20 units, 50 per unit for the next 20 units, and 30 per unit for any additional units demanded. Marginal cost is constant at 30 and there are no fixed costs.



a) Each consumer gets consumer surplus exceeding 400.
b) The profit from this quantity-based price discrimination strategy exceeds the profit from uniform monopoly pricing by more than 200.
c) This outcome from this price discrimination system is efficient. (Total surplus is maximized.)
d) All of the above.

20. Corporations play an important role in the world economy. Which of the following statements about corporations is NOT true?

a) Corporations have limited liability in that the owners cannot be held personally liable for the firm's debts.
b) The separation of ownership and control in large corporations can cause agency problems in which managers do not necessarily maximize profits.
c) Before becoming a corporation a firm must go through an IPO (initial public offering).
d) In countries like the United States (and Canada) corporations make up only a minority of the overall population of private sector firms.

Part II

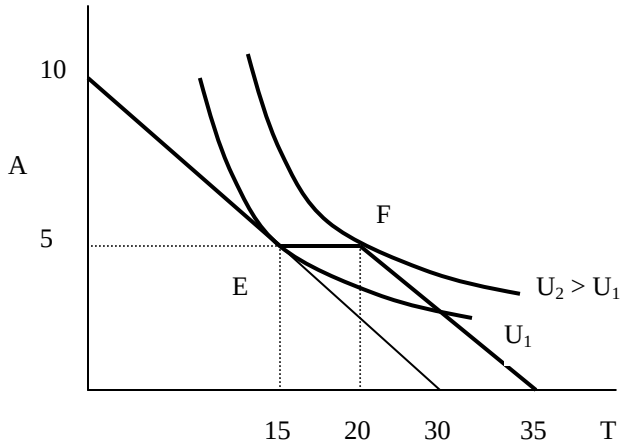
LONGER ANSWER QUESTIONS

Answer only 4 of these 5 questions. If you answer all 5, only the first 4 will be graded. Please show your working and answer the question within the space provided.

1. Consumer Theory

Connie has a monthly budget of \$60 that she allocates between avocados (A) and tomatoes (T). Suppose the price of avocados (P_A) is \$6/kg and that of tomatoes (P_T) is \$2/kg. Connie has standard convex indifference curves.

a) The initial consumption bundle that maximizes Connie's utility is 5kg of avocados and 15 kg. of tomatoes. However, the seller then offers a promotion providing an extra 5kg of tomatoes for free if 15 kg. of tomatoes are purchased. In a diagram with A on the vertical axis show the new budget line. Illustrate and explain (briefly) the effect of the promotion on Connie's consumption bundle. (**5 pts**)

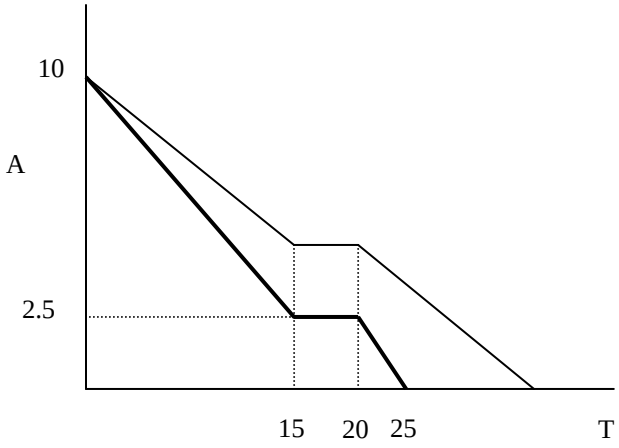


The diagram is worth 4 points. Students must show

i) a correctly draw budget line as shown by the heavy kinked line
ii) indifference curves touching the corner given by E and the corner given by F.
iii) intercepts of 10, 30, and 35.
iv) correct amounts of 15 and 20 as shown to indentify the horizontal segment.

*The explanation is worth **1 point**. The basic idea is that the promotion enables Connie to get more tomatoes at no additional cost, so she will take advantage of the promotion and consume more tomatoes.*

b) On a new diagram illustrate what happens to the budget line if the promotion in part a) remains in place but the price of tomatoes rises from \$2 to \$3. Explain briefly. (**4 pts**)



The diagram is worth 3 points. Students must show the new heavy budget line.
The explanation should indicate that the maximum amount of avocados that could be bought is unchanged, while the maximum amount of tomatoes falls as the price of tomatoes rises. The horizontal part of the budget line covers the same quantity range as before.

c) Show (using algebra) that Connie's initial consumption bundle is consistent with a utility function given by U = AT. (Hint: recall that utility maximization requires that the MRS equals the slope of the budget line which implies that the marginal utility per dollar must be the same for each good consumed.) (**6 pts**)

Students must indicate that MRS = MRT ***OR*** *MRS = price ratio* (P_T/P_A) ***OR*** $MU_T/P_T = MU_A/P_A$. *They can state this in words or in symbols.*

Students must state or show that $MU_T = A$ *and* $MU_A = T$.

Students can use $MRS = MU_T/MU_A = P_T/P_A$ *or equate the marginal utilities per dollar* ($MU_T/P_T = MU_A/P_A$). *Specifically,* $MU_T/P_T = A/2$ *and* $MU_A/P_A = T/6$ *so* $A/2 = T/6$ *or* $3A = T$.

Students must recognize that they need to use the budget constraint $6A + 2T = 60$ *for*
Students can then substitute $3A = T$ *into the budget constraint so* $6A + 2(3A) = 60$ *or* $12A = 60$ *or* $A = 5$. *It follows that* $T = 3A = 15$. *Therefore,* $A = 5$ *and* $T = 15$ *as required.*

2. Competitive Markets

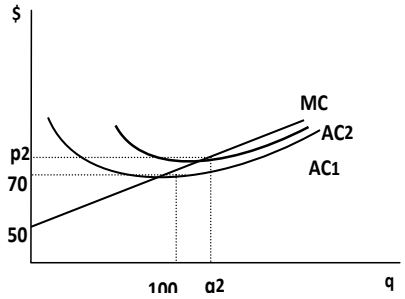
In a perfectly competitive bicycle market in Vancouver, the total monthly demand is given by $Q_d = 1070 - P$, where Q = total number of bikes and P = price of bikes. Each bike supplier (including the potential entrants) has a cost function given by $C(q) = 1000 + 50q + 0.1q^2$, where q = number of bikes produced by a firm per month.

a) Calculate the long-run equilibrium price in this industry. (**5 pts**)

MC = 50 + 0.2q
AC = 1000/q + 50 +0 .1q
In the long run competitive equilibrium MC = AC so 50+0.2q = 1000/q +50+0.1q
Solving for q yields q = 100
*P = MC = 50+ 0.2*100 = $70*

***OR** students can say that the long run equilibrium is at the minimum of the AC curve*
AC = 1000/q + 50 + 0.1q
$dAC/dq = -1000/q^2 + 0.1$
Setting dAC/dq = 0 yields q = 100
*P = AC = 70 **(1 pt)** (or P = MC = 70).*

b) Now suppose that the <u>fixed costs</u> of production of these firms increase due to the increase in rents they have to pay for their spaces. Draw a diagram for a typical firm showing what happens to its marginal cost of production (MC), average total cost of production (AC), and the long-run equilibrium price and quantity. No numerical calculation is necessary, and also the graph does not have to be drawn to scale. (**6 pts**)



Features of the diagram include:
A straight MC curve cutting the AC curves at the minimum points.
The diagram should show only one MC curve (it does not change).
A roughly u-shaped AC curve.
The new AC curve is shifted up.
There should be a new price at the minimum of the new AC curve that is higher than the old price.
There should be a new quantity at the minimum of the new AC curve that is higher than the old q.

c) Consider the diagram you have drawn in part (b) and explain whether firms will exit or enter the market in the long run as a result of the increase in fixed costs. Briefly explain your reasoning. (**4 pts**)

Firms will exit the market in the long run.

The reasoning includes two facts. First, we can see from the diagram that price must rise, so the total amount sold must fall as we move up the industry demand curve. ***(1 pt)***

In addition, the amount produced by each firm rises, as shown on the diagram. If the output per firm and rises and total output falls, there must be fewer firms, so exit must occur.

3. Cost and Production

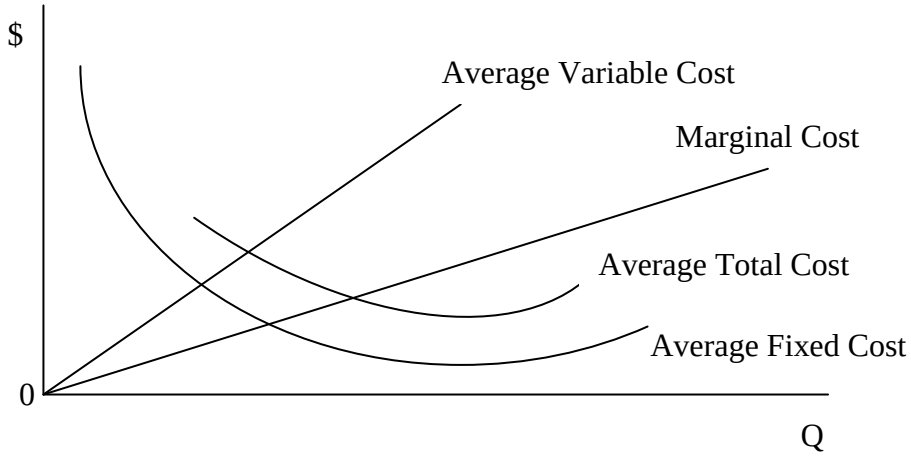
Answer the following three questions involving production and cost.

a) JR Enterprises assembles computers in a Vancouver workshop. Each computer requires 15 hours of labour to assemble. The wage rate for labour is $20/hour. The workshop rent(including lighting, heat, etc) is $2000 per month. Let Q denote the number of computers assembled in one month. Write down an expression for the average total cost of assembling Q computers in one month. (**5 pts)**

The variable cost is $300 per bicycle (15 hours of labour @ $20/hour wage). The fixed cost for the factory is $2,000 per month. The monthly cost function is therefore: $C(Q) = 300Q + 2000$.

$AC = C(Q)/Q = 300 + 2000/Q$.

b) TB Enterprises produces canned fruit. The cost of producing Q cases of canned fruit is $C(Q) = 5Q + 0.2Q^2 + 100$. A student from last year's managerial economics class was asked to graph marginal cost (MC), average fixed cost (AFC), average variable cost (AVC) and average total cost (ATC). The student's graph (see below) was not required to be drawn to scale, but the shapes and relative positions of the curves had to be accurate. Briefly describe three mistakes the student made when drawing the graph. (**6 pts)**



Any three of the following four mistakes: Each correctly identified mistake is worth ***2 pts.***

(a) Average fixed cost should continue to fall as Q is increased (i.e., no "U" shape)
(b) The average variable cost schedule should lie below the marginal cost schedule
(c) The intercept of the average and marginal cost schedules should be positive and equal to 5 (not zero)
(d) Marginal cost should cut through the minimum of average total cost.

c. Suppose a production process combines labour (L) and capital (K) to produce output (Q). Suppose this production function has decreasing returns to scale for all output levels. Assume factor prices remain fixed. Briefly explain what happens to output if L and K are both doubled and state what you can say about the shape of the average cost curve. (**4 pts**)

Effect on output: *Decreasing returns to scale implies that if L and K are both doubled, then Q will less than double.*
Shape of average cost: *Since Q less than doubles and cost exactly doubles when both L and K are doubled, the average cost curve slope upwards. (AC increases as Q rises.)s increasing.*

4. Pricing

Answer the following three questions involving pricing strategies.

a) Fitting-in-Fitness offers sessions with a personal trainer. The marginal cost of offering this service takes on a constant value of 2.The inverse demand for a session with a personal trainer is given by $P^S = 10 - 2Q$ for university students and $P^R = 14 - 3Q$ for regular adults (Q is number of sessions sold and P is price per session). Assuming that Fitting-in-Fitness is able to price discriminate by charging different prices for these two groups, what prices should it set for university students and regular adults? (No diagram is needed.) (**6 pts)**

Marginal revenues:

$MR^S = 10 - 4Q$ *for students and*

$MR^R = 14 - 6Q$ *for regular adults*

For profit maximization from sales to the two groups:

$MR^S = MC = 2$

$MR^R = MC = 2$

From Equation (1) , $10 - 4Q = 2$

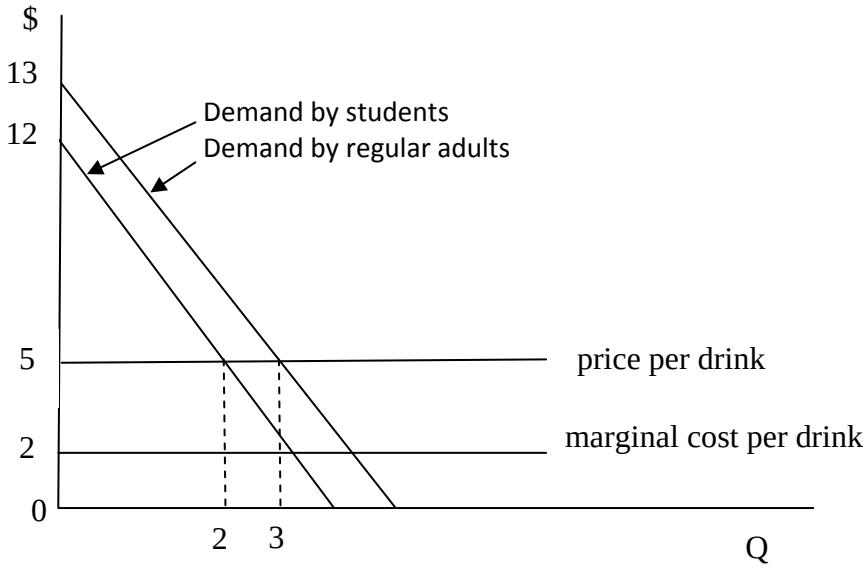
$Q_s = 2$

and from Equation (2), $14 - 6Q = 2$

$Q_R = 2$

Substitute Q = 2 into the inverse demand equations for the two groups to get the pair of optimal prices: $P^s = 10 - 2(2) = \$6$ *for students and* $P^R = 14 - 3(2) = \$8$ *for regular adults.*

b) The following diagram shows the demand for drinks at a night club by one representative student and one representative regular adult. The diagram also shows that the marginal cost of supplying drinks is constant at $2. A local bylaw requires the club to charge $5 per drink for all customers and to charge the same cover charge for all customers. There is an equal number of student and regular adult customers. Using the diagram, determine the profit maximizing cover charge and calculate the club's profit. (**5 pts)**



*The profit maximizing cover charge is equal to the consumer surplus of the representative student--the lower-demand consumer. This surplus is equal to 0.5(12 – 5)*2 = 7, so the profit maximizing cover charge is 7.*

*Coverage charge revenue from the student and the regular adult is 2*7 = 14. Revenue from the sale of drinks is 5*(2 + 3) = 25. The cost of supplying the drinks is 2*(2 + 3) = 10. Combined profits therefore equal 14 + 25 – 10 = $29.*

c) Consumers prefer pricing strategies that maximize consumer surplus. Firms prefer pricing strategies that maximize profits. Consider the following three profit maximizing pricing strategies given the assumption that all consumers have identical demand:
(1) uniform monopoly pricing (the same price per unit for all customers);
(2) perfect price discrimination; and
(3) monopoly two-part pricing.

How would consumers ranks these three pricing strategies? How would producers rank them? Explain briefly. (**4 pts)**

Consumers would equally rank pricing strategies (2) and (3) as the two worst strategies because in both cases consumer surplus is zero. Under strategy (1) CS is positive.

Firms would equally rank (2) and (3) as the two best strategies because in both cases profits are at their highest possible level.

5.Oligopoly

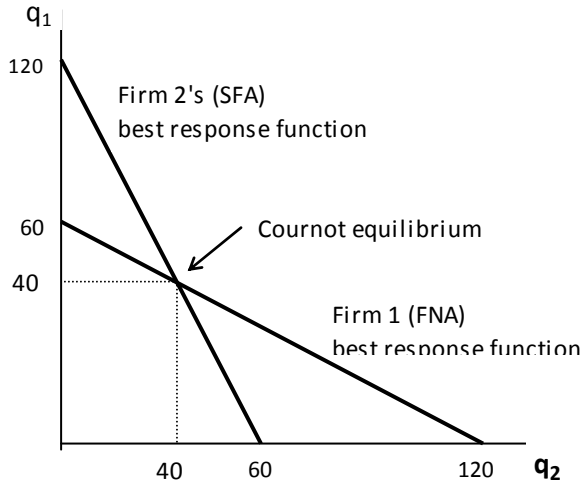
Fly-by-Night (FNA) Airlines and Smiley-Face Airlines (SFA) are Cournot duopolists on a particular route. The overall demand for air travel on this route is given by inverse demand curve P = 300 – 2Q. Each firm has a constant marginal cost of 60 per passenger. Denote the output of FNA as q1 and the output of SFA as q2.

a) Calculate the best response functions for both firms and determine the Cournot equilibrium quantity for each firm. (Do not draw a diagram for this part.) (Hint: you may derive the best response function for one firm and use the symmetry of the situation to infer the best response function of the other.) (**7 pts**).

$P = 300 - 2(Q_1 + Q_2)$
Firm 1's Revenue $R_1 = PQ_1 = [300 - 2(Q_1 + Q_2)]Q_1 = 300\,Q_1 - 2Q_1^2 - 2Q_1Q_2$
$$MR_1 = 300 - 4Q_1 - 2Q_2$$

Firm 1's best response function (that is, its profit-maximizing quantity given Firm 2's output level) is given by $MR_1 = MC_1$
$$300 - 4Q_1 - 2Q_2 = 60$$
$$Q_1 = 60 - 0.5Q_2$$
By symmetry, Firm 2's best response function is:
$$Q_2 = 60 - 0.5Q_1$$
Solving the two best-response functions: $Q_1 = Q_2 = 40$

b) Illustrate the solution in a best-response curve diagram. Put the output of FNA on the vertical axis. Show the best-response functions and the solution. Assign numbers to the intercepts and to the equilibrium. (**4 pts**).



c) Explain why this Cournot equilibrium is an example of a Nash equilibrium? (**4 pts**).

The answer should include a statement that at the equilibrium each firm is doing the best it can (or choosing its best output or maximizing profit) given the output of the rival firm. Or students might say that neither firm regrets its output level given the output level chosen by the rival.

In addition, a good explanation would indicate that a Nash equilibrium arises when each firm is doing the best it can – making the best choice it can – given the choice of its rival.

The Cournot equilibrium is an example or special case of a Nash equilibrium in which the strategy variable (or decision) is quantity or output.