ECON 301: Intermediate Microeconomics.   **Summer, 1997.**
Instructor: A. Appiah

Review Questions

1. Using appropriate diagrams, show/derive the following:
(a). Ordinary/Compensated demand curves (b). Income and Substitution effects of an increase/decrease in the price of a normal/giffen good. (c). Engel/Income-consumption/Price-consumption curves for perfect complement/perfect substitute/Cobb-Douglas/quasilinear preferences.

2. Given $U = U(x,y)$, what is the equation of an indifference curve? Show that the slope of an indifference curve is equal to the marginal rate of commodity substitution.

3. Show that the point elasticity at the mid-point of a linear demand curve is equal to unity.

4. If preferences are represented by concave indifference curves is the substitution effect still negative?

5. Suppose that the consumer's preferences only depend on the ratio of good 1 to good 2. This means that if the consumer prefers (x_1, x_2) to (y_1, y_2), then he automatically prefers $(2x_1, 2x_2)$ to $(2y_1, 2y_2)$, $(3x_1, 3x_2)$ to $(3y_1, 3y_2)$ and so on. In fact, the consumer prefers (tx_1, tx_2) to (ty_1, ty_2) for any $t > 0$. Preferences that have this property are known as **homothetic preferences.**
 Show that perfect substitutes, perfect complements and Cobb-Douglas preferences are all homothetic preferences. Show (algebraically) that if preferences are homothetic, Engel curves are straight lines through the origin.

6. Anita is known to have the following utility function:
$$U(x,y) = x + 8y - x^2 - xy - y^2.$$
The budget available to Anita is $95, the price of one unit of x is $10 and the price of one unit of y is $5.
a. Write down Anita's decision problem. What are the endogenous variables? What are the exogenous variables?
b. Using the Lagrangean multiplier method, find the demand functions.
c. What is the value of the Lagrangean multiplier (λ)? What is the meaning of this value?
d. Do the demand functions satisfy the homogeneity assumption? Do they satisfy the Engel aggregation law?

7. Let $U(x,y) = \ln x_1 + x_2$. Show that demand for x_1 is independent of income. What type of preferences does $U(.)$ represent?

8. Anita has received a one-off unexpected extra monthly grant allowance of $38 and has decided to spend it on entertainment. She can spend the money on tickets to the cinema, concert hall and jazz club and the prices of the tickets are $2, $4 and $8 respectively. Her marginal utility functions, measured in utils, are shown below:

No. of tickets	Cinema	Concert Hall	Jazz Club
1	10.0	12.0	25.0
2	8.0	8.0	18.0
3	4.0	6.0	16.0
4	3.5	4.0	12.0
5	3.0	2.0	10.0
6	2.0	1.5	7.0

| 7 | 1.0 | 0.5 | 5.0 |
| 8 | 0.5 | 0.25 | 3.0 |

a. How many tickets should she buy for the cinema, concert hall and jazz club if she is to maximize her total utility? Explain why this is the only combination which fulfills all the necessary conditions for utility maximization.

b. If Anita is told at the box-office that there are only two jazz tickets available, how should she re-allocate the surplus money from the third jazz ticket between cinema and concert hall tickets in order to achieve a 'second-best' alternative to her original choice?

9. An electrical discount store selling hi-fi speakers noticed that during the previous year, their 'Ardon' 30 watt speakers had sold at a steady average of 200 a month throughout the year. However, during June and September, sales had dropped to only 120 units per month. These slack periods seemed to coincide with the months when special offers were extended on their 'Imai" 30 watt speakers which brought their prices down from $200 to $160 per pair.

a. What is the cross-price elasticity of demand between 'Ardon' and 'Imai' speakers? Does the result indicate any clear relationship between the two types of speakers?

b. If the retailer wished to promote 'Ardon' speakers, what sales would you predict for that type of speaker if the prices of 'Imai' speakers were raised from their usual $200 to $220?

10. A risk-averse individual is offered a choice between a gamble that pays $1000 with a probability of .25 and $100 with a probability of 0.75, or a payment of $325. Which would he choose? What if the payment was $320. What if the individual was a risk-lover?

11. A BC exporter of mini waterpumps used in ornamental fountains has to decide whether or not to lease new capital equipment. The firm realizes that the demand for such products in the world market is income so that demand for the pumps will vary strongly with disposable income. The company has enlisted the services of a macroeconomic forecasting team to calculate various probabilities and profit returns given different demand conditions in the world market. An assessment of the exporter's utility outcomes is also given. The results are shown in the following Table:

Demand conditions	Probability	Leasing		No Leasing	
		Profit	Utility	Profit	Utility
Above Normal	0.25	80	92	60	76
Normal	0.50	50	40	34	60
Below normal	0.25	0	0	20	20

Profit is in 000's of $ and Utility is in 000's of utils.

If the exporter's utility function is $U = 300P - 2P^2$ where U is total utility and P is profits is dollars,

a. Determine whether the exporter is a risk neutral, risk lover or risk averter.

b. Explain the relationship between utility and risk taking which you noticed in (a) above within a business context.

c. What project would he choose if his object was to (i). take a gamble and maximize profits regardless of any risks, and (ii). maximize utility?

12. What is the maximum premium a *risk loving* individual would pay for insurance? Illustrate your answer with an appropriate diagram. What is the implication of this for insurance markets?

13. Examine the role of transactions costs in influencing the growth of a firm.

14. Clearly distinguish between *generic* and *specific* inputs.

15. Given the following production function:

$$Q = f(x_1, x_2^0)$$

(i). Write expressions for $AP(x_1)$ and $MP(x_1)$.
(ii). Show that $AP(x_1) = MP(x_1)$ when $AP(x_1)$ is maximum.
(iii). Show that *the law of diminishing marginal productivity* holds.
(iv). Show that the output elasticity of x_1 can be expressed as the ratio of marginal and average productivities. (*Hint*: the output elasticity of x_i is defined as the proportionate rate of change of Q with respect to x_i).

16. For the production function given below, Q = output, x_1 and x_2 are inputs.

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$$Q = Ax_1^\alpha x_2^\beta$$

Find the following: (i). *MP* (ii). *AP* (iii). output elasticities of x_1 and x_2. (iv). Show that *the law of diminishing marginal productivity* holds.

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Also:
1. All practice questions given during lectures.
2. Eaton & Eaton, p. 67, # 4, 5; p. 68 #10; p. 108 #6, 9, 12; p. 138 #5; p. 168 #4.

Do not hesitate to see me or your TA if you have any difficulties.

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Review Questions Based on Chapters 7 and 8

1. If a firm is producing where $MP_1/w_1 > MP_2/w_2$, what can it do to reduce costs but maintain the same output?

2. In terms of "capital" and "labor", what does the law of diminishing returns state? With reference of stage II of production (a) why does the producer operate in stage II, (b) what factor combination (within stage II) will the producer actually use and (c) where will the producer operate if $P_{Labor} = 0$? If $P_{Labor} = P_{Capital}$?

3. On one set of axes, draw three isoquants showing zero elasticity of factor substitution and constant returns to scale. On another set of axes, draw three isoquants showing infinite elasticity of factor substitution and constant returns to scale.

4. Given the production function $Q = AK^aL^{1-a}$, find the elasticity of factor substitution. Show that the production function is homothetic. What is the equation of the expansion path? Discuss the significance of the intercept and slope of the expansion path.

5. Explain what is meant by (a) constant returns to scale (b) increasing returns to scale (c) decreasing returns to scale. Explain briefly how each of these might arise.

6. With respect to the production function in the Table below, (a) indicate the nature of returns to scale.
(b). Which of these points are on the same isoquant? (c). Is the law of diminishing returns operating?

	1L	2L	3L
3K	80	120	150
2K	70	100	120
1K	50	70	80

6. What are some of the implicit costs incurred by an entrepreneur in running his firm? How are these costs estimated? What price does a firm pay to purchase or hire the inputs it does not own?

7. Give some examples of fixed and variable factors of production in the short run. (b) What is the relationship between the quantity of fixed inputs used and the short run level of output?

8. Assuming for simplicity that labor is the only variable input in the short run and that the price of labor is constant, explain the U-shaped of (a) the SAVC curve and (b) the SMC curve in terms of the shapes of the AP_L and MP_L curves, respectively.

9. What is the relationship between the long run and the short run? (b) How can the LAC be derived? What does it show? (c) Both the SAC and the LAC are U-shaped but the reasons for their shapes are different. What are these reasons?

10. State the relationship between production functions and cost curves. (b) Explain how we can derive TP, AP and MP curves for a factor of production from an isoquant diagram. (c) Explain how we can derive the TVC curve from a TP curve.

11. In the diagram, OA is the expansion path. If $P_L = P_K = \$100$,
(a) Find the Long Run Total Cost (LTC) schedule and plot it and
(b) assuming that the amount of capital used per time period is
kept fixed at 5 units, explain why the short run total cost STC
can never be less than the LTC.
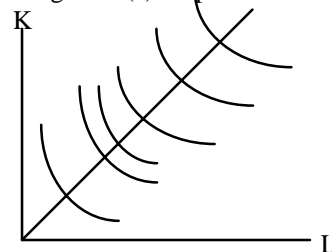
12. The production function provides estimates of maximum weekly output of a company producing embroidery shirts, given in combination of labor and capital.

Capital	Output
60	12 28 32 40 48 50
50	18 30 40 48 52 48
40	18 30 40 48 48 40
30	14 32 36 40 40 30
20	8 24 30 32 30 24
10	2 8 18 24 24 18
	10 20 30 40 50 60 Labor

If the total cost of producing shirts is $1200 per week, the wage rate is $20 per week, and then the rent on machinery is $60 per week, complete the following:

(a). Derive the isocost line in the form of a straight line relating K to L.

(b). Write down the actual isocost equation for this firm using the information provided. Draw this isocost. If the rental rate halves while the wage rate remains constant, draw the new isocost line.

(c). Draw the production isoquants at the levels of 18, 30 and 40 shirts per week and connect the points on each isoquant with a smooth curve. Read off from the graph the optimal number of shirts which could be produced when the wage rate is $20 per week and the rental rate on capital rate is $60 per week. What would be the optimum weekly output if the rental rate was halved?

(d). What are the values of the marginal rate of technical substitution at the optimal points noted in (c)?

(e). Compare the two optimum positions in terms of the capital and labor used. Does this help us understand the difficulties in using only labor productivity as a measure of efficiency?

13. Given that the total cost function of fertilizer company is in the form: $TC = 300 + 50Q - 10Q^2 + Q^3$ where Q = is in tons per hour of nitrates produced:

(a). Find the value of total fixed costs and expressions for the Average Total Cost, Total Variable Cost, Average Variable Cost and marginal cost functions.

(b). Show that the AVC curve is U-shaped and that the MC curve will intersect the AVC curve at the lowest point of the latter.

(c). What is the tonnage of fertilizer that should be produced to minimize short run AVC? What will be the AVC per ton at this output?

Also, practise Eaton & Eaton questions that were not assigned.

Any difficulties? See Erik, Jilany or myself.

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Review Questions Based on Chapters 9 and 10

1. If each firm is in long-run equilibrium, need the industry also be in long-run equilibrium? (b). If the firm and the industry are in long-run equilibrium, need they also be in short-run equilibrium? (c). Discuss the efficiency implications of a perfectly competitive industry when in long-run equilibrium.

2. Must all firms in a perfectly competitive industry have the same cost curves so that when the industry is in long-run equilibrium, they will all break even? Explain.

3. Distinguish between (a) decreasing returns to scale and increasing cost industries (b) increasing returns to scale and decreasing cost industries and (c) constant returns to scale and constant-cost industries.

4. A handicraft sector of a mature economy is composed of many identical small firms which are producing high quality lamp shades. The equation for each firm's long-run average cost is $Q + 225/Q$ and the long-run marginal cost of each firm is $2Q$, where Q is the number of shades produced.

(a). Find the profit maximizing level of output and price for each firm under conditions of long-run equilibrium.

(b). If the market demand function at this optimum level of output is $Q = 6000 - 50P$, calculate the market output of lamp shades and the number of firms in the industry.

(c). If there is a short-run increase in the market demand for lamp shades so that the new demand function is $Q = 7000 - 50P$, find the new short-run price level and the short-run total abnormal profits for each firm. What type of industry is it?

5. Discuss the key differences between perfect competition and pure monopoly if the monopolist does not affect factor prices.

6. Compare the long-run equilibrium point of a pure monopolist with that of perfectly competitive firm and industry. Should the government break up a large monopoly into a large number of perfectly competitive firms?

7. Are cases of pure monopoly in Canada today? What factors limit the pure monopolist's market power? Will a monopoly ever produce a pareto-efficient level of output on its own?

8. Contrast pure monopoly with regulated monopoly. What are some of the regulatory measures of monopoly power? What are the trade-offs associated with these measures? Why is the average cost pricing rule not an efficient regulatory mechanism?

9. Write short notes on the following: *The Burden of Monopoly, The Appropriability Problem, Mark-up Pricing Rule, The Lerner Index of Monopoly Power, Optimal Patent Policy, Market Segmentation.*

10. Given the demand function $Q = 12 - P$, (a) find the D and MR schedules. (b) Plot the D and MR schedules and (c) find the MR when $P = \$10, \$6$ and $\$2$.

11. Will the monopolist continue to produce in the short-run if he incurs a loss at his best short-run level of output? What happens in the long-run?

12. The demand function faced by a monopolist is $Q = 17 - P$. The monopolist operates two plants with different SMCs at various levels of output given in the Table below:

Q	1	2	3	4	5
SMC_1	3	4	7	11	15
SMC_2	5	7	9	13	17

(a). Determine (numerically and geometrically) the profit-maximizing level of output.

(b). How much of this output should be produced in each plant, and why?

13. Using appropriate diagrams, show (a) a monopolist operating the optimum scale of plant at its optimum rate of output when in long-run equilibrium, (b) a monopolist overutilizing a larger than the optimum scale of plant when in long run equilibrium.

(c). Discuss the condition which determines whether a monopolist will operate the optimum scale of plant, a larger than the optimum scale of plant, or a smaller than the optimum scale of plant, when in long-run equilibrium.

14. Two demand functions facing a monopolist are $Q_1 = 12 - P$ and $Q_2 = 8 - P/3$. The monopolist incurs a SMC of \$1 to increase output from one to two units, a SMC of \$3 to increase output from two to three units, a SMC of \$9 to increase output from three to four units and a SMC of \$18 to increase output from four to five units.

(a). At what price will the monopolist supply the best level of output when Q_1 is his demand curve? If Q_2 is his demand curve?

(b). Check your results by using the formula MR = P(1 - 1/e).

(c). What can you say about the monopolist's short-run supply curve?

15. What conditions must exist for price discrimination to be possible? Profitable?

16. A monopolist, selling in two separate markets, faces the following demand functions: $Q_1 = 24 - 2P$ and $Q_2 = 16 - P$. The monopolist operates a single plant with LTC as in the Table below

Q	10	11	12	13	14	15
LTC(\$)	82.5	88	94.50	104	119	142.5

(a). Find the LMC and the LAC schedules for this monopolist.

(b). Find the best level of output for the monopolist: how much of this output should be sold in each market? At what price should the output be sold in each market? How much profit will he make in each market? Compute the Lerner Index of Monopoly power in each market.

17. If a monopolist faced a D function given by $Q = 12- P$,

(a). what would be the monopolist's TR if he sold six units of the commodity?

(b). What would be the monopolist's TR if he practiced first-degree price discrimination? How much of the consumer's surplus is the monopolist extracting?

(c). If the monopolist sold the first three units at a price of \$9 per unit and the next three units at a price of \$6 per unit, how much of the consumer's surplus would he extract?

18. Give two real-world examples each of *second-degree* and *third-degree* price discrimination.

19. If $Q = 100/P$ and $C(Q) = Q^2$, what is the optimal level of output of the monopolist? What if demand is $Q = 10P^{-3}$ and the cost function $C(Q) = 2Q$?

20(a). Show (algebraically) that a monopolist will always set price above marginal cost.

(b). Examine the effects of (i) a *lump sum tax* and (b) an *excise tax* on the optimal price and output of a pure monopolist.

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Review Questions Based on Chapters 11 and 13

1. Write short notes on: *Nash Equilibrium, Dominant Strategy, Collusive oligopoly.*
2. Compare and contrast the Cournot and Bertrand oligopoly models in terms of assumptions and price and output in equilibrium. Which of two models is more characteristic of the supply behavior of modern firms?
3 Assume that (1) there are only two firms, Alpha and Beta, selling a homogeneous product produced at zero cost, (2) the total market demand function is given by $Q = 240 - 10P$, where P is the price in dollars, (3) firm Alpha enters first, followed by Beta (4) the firms play a Cournot duopoly game.
(a) Show how the two firms reach equilibrium (using an appropriate diagram).
(b) What price will each charge in equilibrium? How does the price compare with the monopoly price?
4. The production of synthetic dye is dominated by two multinational firms, Alpha and Beta. They have found over the year that price and output competition between them has resulted in the fall of market price of the dye to $10 per liter leaving a profit of only $300,000 between them. As a result, they have decided to form a centralized cartel and maximize joint-profit. The demand function for the cartel is $Q = 200 - 10P$ where P is price in dollars and Q is in millions of liters. The total cost functions for Alpha and Beta are $C_A = 6Q_A + 0.1Q^2_A$, and $C_B = 2Q_B + 0.1Q^2_B$, respectively.
a. Determine the equations for the marginal revenue and marginal cost of the centralized cartel.
b. Calculate the common price and total output of the cartel. In what proportions would this be shared between Alpha and Beta?
c. Determine the share of total profits which will go to each company. Has the formation of the cartel been successful for the companies?
5. What do we mean when we say that a firm is perfect competitor in the product and factor markets? How does the firm decide whether or not to employ an additional unit of a factor? Why are we interested in the declining portion of VMP schedule of a factor?
6. A person values two things: goods (G) and leisure (L). If we assume that goods can be bought only out of wage income, all of which is spent, and that the person works H hours a day at a real wage of *w* per hour, then
a. Give the equations for his income/expenditure per day and his hours of work per day.
b. Write down the expression for the utility function (U) which needs to be maximized.
c. Prove that in the optimum position, the person equates the marginal benefit of work against the marginal cost of the leisure foregone.
d. If the person's utility function is $U = G + 2L^{1/2}$ then derive the labor supply function.
7. Assume that $Q_a = -2 + P_a/5$ is the supply function of factor A facing a monopsonist buyer (where P_a is the per unit factor price)
a. Find the equations of the monopsonist's supply and marginal factor curves.
b. If factor A is the monopsonist's only variable factor and his MRP_a is $60 at $Q_a = 4$ and $40 at $Q_a = 6$,
(i) determine how many units of factor A this monopsonist will employ to maximize profits. What P_a will he pay? What is the amount of monopsonistic exploitation (excess of MRP over P_a)?
8. Eaton & Eaton, *p. 459 # 2, 3, 5; p. 460 # 6, 7, 9*