

# Final Exam (total = 60 points) - Answers

Managerial Economics Course 2017

**DIRECTIONS:** Answer all questions and show your work.

Make sure that your handwriting is readable.

Remember to include your name on your answer sheet

April 2017 Exam

Name: \_\_\_\_\_

Student ID \_\_\_\_\_

Have you previously passed this course?

Yes / No



Question # 1. (6 points, 1 point each)

Explain the following (short answers):

- a. Why is scarcity a fundamental concept in economics?
- b. What is the difference between accounting and economic profits?
- c. What is the marginal rate of substitution (MRS)?
- d. In forecasting, how does a naïve model work?
- e. Name four of Porter's five forces
- f. What is moral hazard?



Question # 2. (9 points)

The demand for a good is given by  $Q = 90 - P_a + P_b + Y$  where  $P_a$  is the good's price;  $P_b$  is the price of another good; and  $Y$  is consumers' income.

- a) Is the price elasticity of demand positive or negative? Can you use this information to know whether the good is a normal good or an inferior good? (1 point)
- b) Is the income elasticity of demand positive or negative? Can you use this information to know whether the good is a luxury good or not? (1 point)
- c) Is the cross-price elasticity of demand positive or negative? Can you use this information to know whether the other good ("good b") is a substitute or a complement for "good a"? (1 point)



Now suppose that consumers' income is 100 and that the price of "good b" is 10. This means that the demand function becomes

$$Q = 90 - P_a + 10 + 100$$
$$Q = 200 - P_a \Leftrightarrow P_a = 200 - Q$$

Suppose further that only one monopoly firm supplies "good a". Its total costs are given by  $TC(Q) = 100Q$

d) What is market equilibrium and how large are the monopoly's profits? (2 points)

e) Now the government sees an opportunity to gain revenue by imposing a 20% sales tax on the monopoly firm. What is market equilibrium now and how large are profits? (2 points)



- f) Given the monopoly's cost function, what can you deduce about the underlying returns to scale in the monopoly's production function (i.e. increasing, decreasing, constant, or some combination)? Briefly explain your reasoning (2 points)



Question # 3. (6 points)

The Cobb-Douglas production function (when there are two inputs, labor  $L$  and capital  $K$ ) is a power function of the form

$$Q = aK^bL^c, a, b, c, K, L > 0$$

- a) Under what values of  $b$  is the marginal product of capital (MPK) decreasing?  
(1 point)

- b) In their original contribution that introduced the function, Cobb and Douglas estimated that in the US manufacturing industry  $a = 1.01$ ,  $b = 0.25$ , and  $c = 0.75$ . Show that this function is linearly homogenous to degree one in labor and capital (i.e. both inputs are changed together, not separately). In other words, show that the function exhibits constant returns to scale. (2 points)



c) Even though the production function is not linear, Cobb and Douglas used linear regression to estimate it. How is this possible? How can linear regression be applied to such a power function? (2 points)

d) Briefly explain what the interpretation for the term  $a$  in the production function is. Would you expect it to hold constant over time? (1 point)



c) Even though the production function is not linear, Cobb and Douglas used linear regression to estimate it. How is this possible? How can linear regression be applied to such a power function? (2 points)

d) Briefly explain what the interpretation for the term  $a$  in the production function is. Would you expect it to hold constant over time? (1 point)



Question # 4. (7 points)

The generic form of the total cost function for producing two products, x and y, is given by

$TC(q_x, q_y) = 10 + aq_x^2 + bq_y^2 + cq_xq_y$ , where  $a, b > 0$  and  $c \in \mathbb{R}$  (i.e. do not assume that c is positive)

- a) When do cost complementarities exist in this case? Explain. (2 points)
- b) Under what circumstances do economies of scope exist in this case? Explain. (2 points)
- c) What can you say about the relationship between cost complementarities and economies of scope in this case? (2 points)



d) Why might economies of scope or cost complementarities arise? (one reason is enough) (1point)



Question # 5. (10 points)

Analyze this question as a linear programming exercise. Consider a company that is producing 2 goods and faces the following constraints on its use of raw materials and processing:

Resource	Quantity of Resources Required Per Unit of Output		Quantity of Resources Available During Period
	Product		
	1	2	
Raw material (units)	20	40	400
Machine-processing time (hours)	5	2	40
Capacity of Assembly Division 1 (units)	1	0	6
Capacity of Assembly Division 2 (units)	0	1	9
	Product		
	1	2	
Profit contribution (\$/unit)	100	60	

With this data, answer the following questions:

- Write down the company's profit function (1 point).
- Graph the company's resource constraints (label axes as  $x_1$  and  $x_2$  for product 1 and 2, respectively) (2 points).



- c) Highlight the feasible solution space in the previous graph (2 points).
- d) In your graph, draw the constant-profit line that maximizes company's profits. Clearly indicate the values on the  $x_1$  and  $x_2$  -axis where the constant-profit line intersects these two axes (2 points).
- e) What combination of  $x_1$  and  $x_2$  maximize company's profits? Show this point in your graph (1 point).
- f) When using linear programming, certain *mathematical* assumptions must be made regarding the objective function and the constraints. What kind of *economic* assumptions can these imply? (2 points)



Question # 6 (10 points, 2 points each)

Suppose that Mike and Ike both have the demand for a public good, which is given by  $P = 50 - Q$  for each of them. Let the marginal cost of a unit of the public good be \$40.

- a. What would be socially efficient amount of the public good? Show your result.
  
  
  
  
  
  
  
  
  
  
- b. Given socially efficient allocation of the public good in part (a), how much Mike and Ike would be willing to pay for the public good?
  
  
  
  
  
  
  
  
  
  
- c. Would this produce a socially efficient allocation of public good in the end, given your answer in part (b)? Explain.
  
  
  
  
  
  
  
  
  
  
- d. If the government were to subsidize the provision of the public good, how large subsidy would be needed to produce the socially efficient allocation of the public good?



- e. Briefly discuss the issues this example raises about the provision of public goods in a more general context.



Question # 7. (6 points, 2 points each)

There are two firms (whose outputs are  $Q_1$  and  $Q_2$ ) in the market. Market demand is given by  $P = 400 - 2 * (Q_1 + Q_2)$ . The cost function for each firm is  $TC = 40 * Q$  (the same for both firms).

a. What is the price and output for each firm for a Cournot equilibrium if the firms determine their outcomes simultaneously? Show results. (2 points)

b. What is the equilibrium price and output for each firm if firm # 1 is a market leader and firm # 2 is a follower? Show results. (2 points)



- c. Use the concept of Nash equilibrium to briefly explain the basic idea of solving the Cournot game i.e. section a)



Question # 8. (6 points, 3 points each)

a) Explain how signaling can overcome market failure caused by asymmetric information (make sure that you mention what is required of a signal for signaling to work)

b) In thinking about the expected value of a choice, how does a risk-averse person behave differently from a risk-neutral person? And what is the difference in the utility functions of a risk-averse and risk-neutral person?