

BBIT/BIT/BSE Y1S1

CAT ONE AND TWO

HBC 2107: INTRODUCTION TO MICROECONOMICS

GIVEN: 03/11/2014

DUE: 03/12/2014

INSTRUCTIONS

- 1) Answer ALL the questions

QUESTION ONE (15 marks)

a) Julie receives utility from days spent skiing (S) and days spent horseback riding (R) as given by the utility $U(S, R) = SR$. The cost of skiing is \$320 per day and horseback riding is \$400. Julie's annual budget for skiing and horseback riding is \$16,000.

- i. Compute Julie's utility maximizing choice of days skiing and Horseback riding and his utility level from consuming that bundle. **(2 marks)**
- ii. Suppose that the price of skiing increases to \$340 per day. Calling his budget both activities x, (suppose by now that it is unknown) find the demand for S and R under the new prices as a function of x. **(3 marks)**
- iii. Compute the income necessary to make Julie reach the same utility level as before the price change. **(1 mark)**
- iv. Compute the quantities demanded with the new prices and the income you found in section c. **(1 mark)**
- v. Compute the quantities demanded with the new prices and the original income. **(1 mark)**
- vi. Using your previous answers tell us what is the total change in quantity demanded of S due to the price increase in P_s that the consumer experiences and what part of that change is due to income or substitution effects. Give definitions of what income and substitution effects mean. **(3 marks)**

b) The demand and total cost functions of some good are given by:

$$2P + 1/2Q - 8 = 0$$

$$C = 2 + Q - 3/20 Q^2 + 1/40 Q^3$$

Compute

- i. The quantity maximizing output $[Q^*]$ and the price charged at this output $[Q^*]$ (3 marks)
- ii. The maximum profit realized (1 marks)

QUESTION 2 (15 marks)

- a) Jacques and Joy are a couple. They are the only people in the family. Jacques's Inverse demand curve for shirts is $P = 5 - \frac{1}{2} Q_B$ while Joy's inverse demand curve for shirts is $P = 10 - 2Q_A$. Calculate their family consumption of shirts when the price is 4 and 6, respectively. (4 marks)
- b) Given the demand function; $Q = 5 - P$. Compute P^* given that the price elasticity of demand is $-4/3$. (3 marks)
- c) Consider a two person economy consisting of Ann and Bob only. Both of them only consume x and y . Ann's utility over these two goods is:

$$U_A(x_A, y_A) = x_A y_A^2 \quad \text{and Bob's utility is:} \quad U_B(x_B, y_B) = x_B^2 y_B$$

Initially, Ann is endowed with 9 units of x , zero units of y , and Bob is endowed with 6 units of y , zero units of x .

Required:

- i. Ann's marginal rate of substitution in terms of x_A and y_A (2 marks)
- ii. Bob's marginal rate of substitution in terms of x_B and y_B . (2 marks)
- d) Assume that the market demand and supply for X is

$$Q_d = 150 - 50P_x$$

$$Q_s = 60 + 40P_x$$

If the government sets a price floor of \$10, what is the change in consumer surplus? How much is the resulting deadweight loss to society (4 marks)

QUESTION 3 (15 marks)

- a) Ryan produces widgets, using as inputs labor (L) and machines (K). His production function is given by the following equation:

$$q = AK^{1/4}L^{1/2}$$

- i. Explain the type of returns to scale that Ryan's production function exhibit (3 marks)

b) At the end of last year, Ryan bought his only machine for \$1,000. He will use this machine for 5 years, after which the machine will have no value. Ryan will calculate depreciation linearly (depreciation will be 20% of the total value of the machine per year). This machine has no other use besides Ryan's production of widgets, and, at this moment, Ryan cannot buy any more machines. Compute Ryan's annual fixed cost of production? Is the fixed cost sunk (not recoverable) or not? Explain. **(2 marks)**

c) Sally's firm produces granola bars with a fixed cost of 10 (this cost is already sunk). Her variable cost function is: $VC = q^2 + 2q$.

i. Assuming the market for granola bars is competitive, derive Sally's supply function? (Hint $Q_s = P = MC$) **(2 marks)**

ii. Compute Sally's surplus if the market price is 6? **(2 marks)**

iii. Compute Sally's profit? **(2 marks)**

d) Consider the Cobb-Douglas production function $Q = b_0 L^{b_1} K^{b_2}$

Compute

i. The Marginal Product of Labour, MP_L **(1 mark)**

ii. The Marginal Product of Capital, MP_K **(1 mark)**

iii. The Marginal Rate of Substitution, $MRS_{L,K}$ **(2 marks)**

QUESTION 4 (15 marks)

a) Bob's utility function over good x and y is $U(x, y) = x^2y$ His income is 100 and price of x is 2 and price of y is 5

i. Compute the Marginal rate of substitution between x and y **(2 marks)**

ii. Compute the quantities of X and Y Bob will buy **(2 marks)**

b) For the production function $Q = K + 3L$,

i. what returns to scale does it exhibit

ii. Let output be a function of three inputs: $Q = AK^a L^b N^c$

- a. Is this function Homogeneous? If so of what degree **(3 marks)**
- b. Using the function in ii above state under what conditions would there be
 - i. Constant returns to scale **(1 mark)**
 - ii. Increasing returns to scale **(1 mark)**
 - iii. Decreasing returns to scale **(1 mark)**

c) A price discriminating monopolist has the following total-cost and demand functions

$$C(q) = 20 + 15Q$$

$$P_1 = 63 - 4Q_1$$

$$P_2 = 105 - 5Q_2$$

$$P_3 = 75 - 6Q_3$$

- i. Write out the total revenue function(s), TR for each market **(1 mark)**
- ii. Formulate the total profit function **(1 mark)**
- iii. Compute the profit maximizing levels of output and price **(1 mark)**
- iv. Compute the maximum profit realized **(1 mark)**
- v. Compute the elasticities of demand in each market **(1 mark)**

QUESTION 5 (15 marks)

Suppose the demand function for corn is $Q_d = 10 - 2p$, and supply function is $Q_s = 3p - 5$. The government is concerned that the market equilibrium price of corn is too low and would like to implement a price support policy to protect the farmers. By implementing the price support policy, the government sets a support price and purchases the extra supply at the support price. In this case, the government sets the support price $p_s = 4$.

- a) Calculate the original market equilibrium price and quantity in absence of the price support policy. **(1 mark)**
- b) At the support price $p_s = 4$, find the quantity supplied by the farmers, the quantity demanded by the market, and the quantity purchased by the government. **(1 mark)**
- c) Draw a diagram to show the change in the producer surplus due to the implementation of the price support policy. Calculate the change in the producer surplus. **(2 marks)**

- d) Draw a diagram to show the change in the consumer surplus due to the implementation of the price support policy. Calculate the change in the consumer surplus. **(3 marks)**
- e) Calculate the cost to the government to implement the price support policy. Draw a diagram to show the government cost **(2 marks)**
- f) Suppose now the government switches from price support policy to subsidy policy. For each unit of corn produced, the government subsidizes the farmer $s = 5/3$.
- i. Compute the new equilibrium price under this subsidy policy. **(4 marks)**
 - ii. Compute the amount of money the government will have to spend in order to implement this subsidy policy. **(2 marks)**