

141
1st SEM. 2016/2017



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UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMME: BSc. in Agricultural Economics and Agribusiness
Management Year II

COURSE CODE: AEM 203

TITLE OF PAPER: MATHEMATICS FOR ECONOMISTS

TIME ALLOWED: 2: 00 HOURS

INSTRUCTION: 1. ANSWER ALL QUESTIONS
2. EACH QUESTION CARRIES 25 MARKS

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Question 1. (25 marks)

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1.1 Given the input-output matrix

$$A = \begin{bmatrix} 0.1 & 0.1 \\ 0.4 & 0.5 \end{bmatrix} \text{ and demand vector } D = \begin{bmatrix} 30 \\ 20 \end{bmatrix}$$

Find the production vector that will enable the economy to meet the demands?

1.2 . 1. A multiproduct firm is faced with the following cost function and a production constraint. The production constraint is stipulated in terms of production quota.

$$\text{Cost function : } C = 2Q_1 + 4Q_2 - Q_1Q_2 + 10$$

$$\text{Production quota: } Q_1 + Q_2 = 16$$

- Set up a constrained cost minimization problem from the information given.
- Construct the corresponding Lagrangian function.
- Determine the critical values of Q_1 and Q_2 .
- Confirm that the critical values present a minimum

Question 2. (25 marks)

2.1 Given $Q = 30 - 3p + 0.02y$, where Q is quantity demanded, p is price, and y is income, and given $p = 60$ and $y = 1000$
Find the a) price elasticity of demand.
b) income elasticity of demand

2.2 The owner of a café has found that the relationship among the daily demand for ice-cream and the prices charged for ice-cream (i) and cool drinks (c) is expressed by means of the equation $D = 2000 - 2.5i + 0.39c$, where D is measured in liters, i in cents per liter and c in cents per can.
Calculate the partial derivatives $\frac{\partial D}{\partial i}$ and $\frac{\partial D}{\partial c}$. Explain the meaning of these derivatives.

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Question 3. (25 marks)

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3.1 Find MPK and MPL for the following production function
 $Q = 16K^{1/2}L^{1/4}$ and determine whether or not the function is characterized with diminishing returns to factor inputs.

3.2 Calculate the definite integrals.

a) $\int_0^1 5^x dx$

b) $\int_1^2 x(x^2 + 6) dx$

Question 4. (25 marks)

4.1 An analysis of the financial statements of a coal mine, indicates that when x tons of coal are extracted a day, the income and cost (E) of the mine are respectively;

$$I(x) = 300x - 2x^2$$

$$C(x) = x^2 - 2x + 500.$$

The mine is taxed at a rate of 30% on its gross profit.

- Determine a. the value of x which maximize the income.
 b. the gross profit and the value of x which maximizes it.
 c. the net profit and the value of x which maximizes it.

4.2 Consider the following demand function for good a

$$Q_a = 200 - 4p_a - 2p_r + 0.2y$$

Where Q_a = Quantity of good a in demand.

p_a = price of good a.

p_r = price of some related goods r.

Y = consumer income.

Given $p_a = 20$, $p_r = 24$, $y = 2000$,

Find the following elasticity and interpret your results.

- Own price elasticity of demand
- Cross-price elasticity of demand
- Income elasticity of demand

END OF PAPER