



MASENO UNIVERSITY
UNIVERSITY EXAMINATIONS 2016/2017

**FIRST YEAR SECOND SEMESTER EXAMINATION FOR THE
DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURAL
ECONOMICS WITH INFORMATION TECHNOLOGY**

MAIN CAMPUS

AEG 107: INTRODUCTION TO MATHEMATICS FOR ECONOMISTS

Date: 15th June, 2017

Time: 12.00 - 3.00pm

INSTRUCTIONS:

- Answer ALL Questions in section A and any other TWO in section B
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SECTION A: 30 MARKS

1. a. Enumerate any five properties of determinants of a matrix. (5 marks)
b. Explain why mathematics is important in economic theory. (3 marks)
2. Explain the following:
 - a. Economic model, (2 marks)
 - b. A variable, (2 marks)
 - c. Principal submatrix. (2 marks)
3. a. Name three properties of subset, (3 marks)
b. If $U = \{2,3,5,7,8,9\}$ and $A = \{7,9\}$, find complement set, (2 marks)
c. If $A = \{3,4,6,8\}$ and $B = \{1,2,5\}$, find $A \cap B$. (2 marks)
4. A firm wishes to maximize its profit given total revenue function as $TR = 2500 - 4Q^2$ and total cost function as $C = Q^3 - 2Q^2 + 180Q + 2000$. Testing for second order condition, calculate the maximum profit that the firm can make. (9 marks)

SECTION B: 40 MARKS

5. a. Consider the following two-commodity market models. Evaluate for equilibrium prices and quantities. Use the Cramer's rule. (10 marks)

$$Q_{d1} = 8 - 2P_1 + P_2$$

$$Q_{s1} = -5 + 3P_1$$

$$Q_{d2} = 16 + P_1 - P_2$$

$$Q_{s2} = -6 + 2P_2$$

- b. Given that $y = f(x) = 3x^2 - 4$, find the rate of change of y with respect to x when $x_0 = 5$ and $\Delta x = 6$. (6 marks)
- c. Evaluate $\lim_{x \rightarrow 5} [(x^3 + 4x)(x - 10)]$ (4 marks)
6. a. The demand and supply functions of mangoes in Kisumu City are $P_d = 40 - 2q$ and $P_s = (q + 1)^2$ respectively. Calculate the consumer and producer surpluses. Use definite integral. (15 marks)
- b. Optimize $f(x) = 2x^3 - 20x^2 + 100x + 60$ (5 marks)
7. A firm operates with the production function $q = 45K^{0.7}L^{0.4}$ and faces the demand function $p = 6,980 - 6q$.

Required:

- a. Derive the firm's marginal revenue product of labour (MRP_L) function. Use chain rule. (15 marks)
- b. If wage is Ksh 100 and capital is 5 units, how much labour should be employed to maximize profit? (5 marks)