



MAASAI MARA UNIVERSITY

**REGULAR UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR
FIRST YEAR FIRST SEMESTER**

**SCHOOL OF BUSINESS AND ECONOMICS
BSC. ECONOMICS/BSC. FINANCIAL
ECONOMICS/BSC. ECONOMICS AND STATISTICS
BACHELOR OF SCIENCE IN ECONOMICS**

COURSE CODE: ECO 1104

COURSE TITLE: FUNDAMENTALS OF MATHEMATICS

DATE: 11TH DECEMBER 2018

TIME: 11.00AM – 13.00PM

INSTRUCTIONS TO CANDIDATES

Answer ALL questions in SECTION A and ANY OTHER THREE questions from SECTION B

This paper consists of THREE printed pages. Please turn over.

SECTION A (25 MARKS)

Question one (25Marks)

- a) State two broad applications of mathematics in economic analysis **(2 Marks)**
- b) A new car has been bought for \$75000 and is assumed to decrease in value by 5% per year over a ten-year period. What is its value after ten years? **(3 Marks)**
- c) Give economic interpretations to each of the following expressions and then use a calculator to find the appropriate values
- i. $50000(1.07)^{14}$ **(3 Marks)**
 - ii. $7500(0.86)^{20}$ **(3 Marks)**
- d) A ball with radius r metres has a volume of $\frac{4}{3}\pi r^3$ cubic metres. By how much does the volume expand if the radius increases by one metre. **(3 Marks)**
- e) Find what values of x satisfy $10x - 6 \geq x + 12$ **(3 Marks)**
- f) At the beginning of the year, an investor had £50000 in two bank accounts, each of which paid interest annually. The interest rates were 4% and 6% per annum respectively. If the investor has made no withdrawals during the year and has earned a total of £2750 interest, what was the initial balance in each of the two accounts? **(4 Marks)**
- g) Solve the systems of equations
- i. $2x - 6y = 4$
 $x - 8y = 2$ **(2 Marks)**
 - ii. $2x - 4y = 19$
 $-5x + 3y = 11$ **(2 Marks)**

SECTION B (45 MARKS)

Question two (15Marks)

- a) Sketch a graph of the straight line $y = 2x + 3$ for $0 \leq x \leq 4$ **(2 Marks)**
- b) Determine the slope and intercept of the straight line $9x + 3y = 4$ **(3 Marks)**
- c) A person has £120 to spend on two goods (X, Y) whose respective prices are £3 and £5.
- i. Draw a budget line showing all the different combinations of the two goods that can be bought with the given budget. **(4 Marks)**
 - ii. What happens to the original budget line if the budget falls by 25%? Hence draw the budget line on the same graph as in (i) above. **(3 Marks)**
 - iii. What happens to the original budget line if the price of X doubles? Hence draw the budget line on the same graph as in (i) above. **(3 Marks)**

Question three (15Marks)

- a) The demand and supply equation of a good are given by

$$4P = -Q_d + 240$$

$$5P = Q_s + 30 \text{ Determine the equilibrium price and quantity. (3 Marks)}$$

- b) The demand and supply functions of a good are given by

$$P = -Q_d + 125$$

$$2P = 3Q_s + 30 \text{ Determine:}$$

- i. The equilibrium price and quantity **(2Marks)**
 - ii. The effect on the market equilibrium if the government decides to impose a fixed tax of £5 on each good. **(3Marks)**
 - iii. Who pays the tax? Hence or otherwise how much? **(2 Marks)**
- c) Sketch the graph of the function $f(x) = 2x^2 + 3x - 2$ for integer values of x for which $-4 \leq x \leq 2$. Hence solve the equation $2x^2 + 3x - 2 = 0$ using the graph. **(5 Marks)**

Question four (15Marks)

- a) Solve the quadratic equation $4x^2 - 11x + 6 = 0$ using the formula. **(3Marks)**
- b) If the fixed costs are 18, variable costs per unit are 4 and the demand function is $P = 24 - 2Q$.
- i. Obtain an expression for profit function, π in terms of Q . Hence or otherwise sketch a graph of π against Q for $P = 24 - 2Q$. **(8 Marks)**
 - ii. For what values of Q does the firm break even? **(1Marks)**
 - iii. Determine the maximum value of the profit function. **(3 Marks)**

Question five (15 Marks)

- a) Simplify the expression
- i. $\frac{Y-1}{Y+1} - \frac{1-Y}{Y-1} - \frac{-1+4Y}{2(Y+1)}$ **(3 Marks)**
 - ii. $\frac{X-Y}{X+Y} - \frac{X}{X-Y} + \frac{3XY}{X^2-Y^2}$ **(4 Marks)**
- b) Let $A = \{11,12,13,14,15\}$ and $B = \{13,16\}$. Find: -
- i. $A \cup B$ **(1 Mark)**
 - ii. $A \cap B$ **(1 Mark)**
 - iii. $A \setminus B$ **(1 Mark)**
 - iv. $B \setminus A$ **(1 Mark)**
- c) An electrical company has a budget of £6000 a week to spend on the manufacture of toasters and kettles. It costs £5 to manufacture a toaster and £12 to manufacture a kettle. Write down the equation of the budget line and sketch its graph. **(4 Marks)**

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