



MACHAKOS UNIVERSITY

University Examinations 2019/2020 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

APP 102: QUANTITATIVE TECHNIQUES FOR POLICY MAKERS

Date:

Time:

Answer question ONE and any other TWO questions

QUESTION 1: 30 MARKS (COMPULSORY)

- a) Solve $\frac{5x}{6} - \frac{2x-1}{3} = \frac{4}{5}$ (5 marks)
- b) Find a number such that 3 more than one half of the number is two thirds the number (5 marks)
- c) Solve for x in $x^2 - 9x + 4 = 0$ (4 marks)
- d) Compute the value of the following limit $\lim_{x \rightarrow 2} (3x^2 + 5x - 9)$ (5 marks)
- e) Use the definition of derivatives to differentiate $f(x) = x^2$ (5 marks)
- f) Find a_6 for an arithmetic sequence where $a_1 = 3x - 1$ and $d = 2x + 6$ (6 marks)

QUESTION 2 (20 MARKS)

- a) Find the equation for the line that has a slope of $\frac{2}{3}$ and passes through (6,2) (4 marks)
- b) Evaluate the indefinite integral defined by $\int (2x^2 + 4x + 3) dx$ (4 marks)
- c) The fourth term of a geometric progression is 27 and the seventh term is 729. Find
- The first term (4 marks)
 - The common difference (4 marks)

d) Evaluate $\frac{\log 125 - \log 25}{\log 25 + \log 5}$ (4 marks)

QUESTION 3 (20 MARKS)

a) A rectangular field has an area of 75 m^2 . The width of the field is 3 m longer than the length of the rectangle. What are the dimensions of the field? (8 marks)

b) Differentiate $f(t) = \frac{3t+9}{2-t}$ with respect to t (6 marks)

c) Determine the points where the function below is not continuous

$$h(t) = \frac{4t+10}{t^2-2t-15} \quad (6 \text{ marks})$$

QUESTION 4 (20 MARKS)

a) The first term of an arithmetic sequence is equal to 6 and the common difference is equal to 3.

i. Find the formula of the n^{th} term (3mks)

ii. Find the 50^{th} term (3mks)

b) Given that the fourth and the eight terms of the arithmetic sequence are $a_4=93$ and $a_8=65$

i. Find the common differences d and the first term a (4 marks)

ii. Find the n^{th} term (2 marks)

c) Find S_{10} for 250, 100, 40, 16,.... (4 marks)

d) Find the 9^{th} term of the sequence

$$1, \sqrt{2}, 2, \dots \quad (4 \text{ marks})$$

QUESTIONS 5 (20 MARKS)

a) Use simplex method to maximize $z = 3x_1 + 2x_2$ subject to the following;

$$-x_1 + 2x_2 \leq 4$$

$$3x_1 + 2x_2 \leq 14$$

$$x_1 - x_2 \leq 3$$

$$x_1, x_2 \geq 0 \quad (14 \text{ marks})$$

b) Evaluate the indefinite integral defined by $\int (x^4 + 3x + 1)dx$ (6 marks)