# MACHAKOS UNIVERSITY

**University Examinations 2020/2021 Academic Year**

**SCHOOL OF PURE AND APPLIED SCIENCES**

**DEPARTMENT OF MATHEMATICS AND STATISTICS**

**FIRST YEAR FIRST SEMESTER EXAMINATION FOR**

**BACHELOR OF ARTS (PUBLIC ADMINISTRATION)**

**APP 102: QUANTITATIVE TECHNIQUES FOR POLICY MAKERS**

**DATE: 23/2/2021**                                                          **TIME: 8.30-10.30 AM**

**INSTRUCTIONS:**
**Answer Question One and Any Other Two Questions**

## QUESTION ONE (30 MARKS) (COMPULSORY)

a)      Solve by factorization method $2x^2 - 5x - 3 = 0$                    (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 $\lim_{x \to 2}(3x^2 + 5x - 9)$     (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 TWO (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

        i.      The first term                                              (4 marks)

        ii.     The common difference                                       (4 marks)

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

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**QUESTION THREE (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

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

**QUESTION FOUR (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  (3 marks)

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

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, ........  (4 marks)

**QUESTIONS FIVE (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$_2 \geq 0$  (14 marks)

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