CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF EDUCATION (ARTS)

MATH 100: GENERAL MATHEMATICS

STREAMS: BED ARTS **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 18/04/2018 **2.30 P.M. – 4.30 P.M.**

INSTRUCTIONS:

- **Answer question ONE and any other TWO questions**
- **Adhere to the instructions on the answer booklet.**
- **DO NOT write on the question paper.**

QUESTION ONE (30 MARKS) (COMPULSORY)

(a) List all the possible sets of real number in which each of the following numbers belong:

(i) $\sqrt[3]{-27}$

(ii) $2\sqrt{81}$

(iii) $5\sqrt{7}$

(iv) $\sqrt{\frac{4}{16}}$ (4 marks)

(b) Simplify $\frac{4^{1.5} \times 8^{\frac{1}{3}}}{2^2 \times 32^{\frac{2}{5}}}$ (3 marks)

(c) The mean 15 observations is 20.8. By mistake, one observation was copied as 23 instead of 32. Calculate the correct mean. (3 marks)

(d) Explain the following properties of real numbers giving an example for each.

(i) Commutative property of addition. (1 mark)

(ii) Reflexive property of real numbers. (1 mark)

(e) Solve for x given $4^{2x+1}=64$. (3 marks)

(f) Using a calculator, evaluate $\log_5 11$. (3 marks)

(g) Given $f(x)=7x+1,$ determine $f^{-1}(2)$. (3 marks)

(h) The function $ax^2+x-7,$ has a remainder of 3 when divided by $x-2. Find$ the value of a .
(3marks)

(i) Determine $\frac{dy}{dx}$ given that $y=\frac{x-1}{x+1}$

(3marks)

(j) Factorise $3x^2+5x+0.75$ (3 marks)

QUESTION TWO (20 MARKS)

(a) Solve for x given:

(i) $5^{2x}-6(5^x)+5=0$ (4 marks)

(ii) $\log_{10}^{x} ¿^2+\log_{10}^{x^2}=3$ (4 marks)

(b) Simplify completely $\frac{2^{n+1}+2^n}{2^{n+3}-2^{n+1}}$ (4 marks)

(c) The expression $2x^3+ax^2+b$ has a remainder of 9 when divided by $(x-1)$ and a remainder of -3 when divided by $(x+2)$. Determine the values of a and b. (5 marks)

(d) Find two numbers whose sum is 8 and whose product is 12. (3 marks)

QUESTION THREE (20 MARKS)

(a) The table below shows the frequency distribution table of masses in Kg of 60 male aspirants in the 2017 general elections.

Mass (kg)	70-74	75-79	80-84	85-89	90-94	95-99	100-104
Frequency	2	4	8	22	18	5	1

Using the data, calculate:

(i) The mean mass. (3 marks)

(ii) The mode. (3 marks)

(iii) The median. (3 marks)

(iv) The 75th percentile. (3marks)

(v) The standard deviation. (3 marks)

(b) Find and classify the turning points of the curve $y=2x^3-6x+4$. (5 marks)

QUESTION FOUR (20 MARKS)

(a) (i) Use the long method to show that $2x^3+x^2-13x+6$ is divisible by $(x-2)$. (3 marks)

(ii) Verify your answer in (a)(i) above using the factor theorem. (2 marks)

(iii) Hence solve $2x^3+x^2-13x+6=0$. (4 marks)

(b) Evaluate $\lim_{h \to 0} \left[\frac{(x+h)^2 - 3x^2}{3} \right]$ (4 marks)

(c) When the price of an item was increased by Sh. 4, Muthoni bought 5 items less with Sh. 300. What was the original price of the item? (7 marks)

QUESTION FIVE (20 MARKS)

(a) Determine $\frac{dy}{dx}$ for the functions below using the indicated method.

(i) $y = \sqrt[3]{(5x-1)^4}$ chain rule (3 marks)

(ii) $y = (x^2+5)(2x^3-7x+1)$ product rule (3 marks)

(iii) $y = \frac{4x^2+1}{4x^2-1}$ Quotient rule (3 marks)

(iv) $y = \frac{5}{x^2}$ First principles (4 marks)

(b) Functions f and g are defined by $f: x \to 7x+1$ and $g: x \to \frac{1}{3}x - 1.$ Show that $fog^{-1} = (g^{-1} o f^{-1})$ (7 marks)
