



TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHS AND PHYSICS

UNIVERSITY EXAMINATION FOR:  
DIPLOMA IN ANALYTICAL CHEMISTRY

AMA 2103 CALCULUS FOR SCIENCE

SPECIAL SUPPLEMENTARY SEPT. 2017

TIME: 2HRS

**Instructions to Candidates**

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of 5 questions.

**Answer Question One And Any Other Two Questions. Do not write on the question paper.**

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**QUESTION ONE (30MKS)**

- a) Given  $f(x) = x^2 + 2x + 3$  and  $g(x) = 3x + 4$  determine  $f \circ g(3)$  and  $g^{-1}(2)$  [4mks]
- b) Evaluate  $\lim_{x \rightarrow -2} \frac{x^2 + x - 6}{x - 2}$  [3mks]
- c) Determine the maximum value of  $y$  if  $y = -0.01x^2 + x + 10$  [6mks]
- d. Find  $\int_1^2 (3x^2 + 4x - 2) dx$  [4mks]
- e. Find the equation of a normal to the curve  $y = 2x^2 - 4x + 4$  at  $x=1$  [6mks]
- f. find  $f \circ g$  given  $f(x) = 2x - 2$  and  $g(x) = x^2 + 2$  hence find  $f \circ g(1)$  [4mks]
- g. From first principles Evaluate  $\frac{dy}{dx}$  at  $x = 1$  if  $y = 3x^2$  [4mks]

**QUESTION TWO [20MKS]**

- a. Find  $f'(x)$  from first principles at  $x = 2$  given  $f(x) = x^2 + 2x + 3$  [5mks]
- b. A straight line passes through A(3 2) B(4 6) and C (1, y) find the value of y [5mks]

- c. Evaluate  $\int_1^3 [2x + 4]dx$  [4mks]  
 d. Investigate the nature of turning points to the curve  $y = -2x^3 + 24x + 4$  [6mks]

**QUESTION THREE [20MKS]**

- a) Evaluate  $\int_0^2 [2x + 3x^2 + 3]dx$  [4mks]  
 b) Using the quotient rule evaluate  $\frac{dy}{dx}$  at  $x=0$  given  $y = \frac{3x+4}{2x+2}$  [6mks]  
 c. Determine inverse ( $f^{-1}(x)$ ) of the function  $f(x) = \frac{x}{2x+4}$  [6mks]  
 d. determine the turning points of the curve  $y = x^3 - 12x + 6$  [4mks]

**QUESTION FOUR (20MKS)**

- a. Given  $h(x) = 3x + 4$  and  $g(x) = 2x + 3$  find  $goh(x)$  and hence evaluate  $(goh)^{-1}(12)$  [5mks]  
 b. Find the equation of a curve given that the gradient function of the curve,  $\frac{dy}{dx} = 3x + 2$  and the curve passes through (2, 6) [5mks]  
 c. Use Simpson rule to evaluate  $\int_1^3 [x + 2]dx$  using  $n=4$  [6mks]  
     Determine the error in c) [4mks]

**QUESTION FIVE [20MKS]**

- a) Find  $\frac{dy}{dx}$  at  $x=0$  given  
     I]  $y = (3x+4)^4$  using substitution [5mks]  
     II]  $y = \frac{3x^2+2}{x^2+1}$  Using quotient rule [5mks]
- b) Evaluate I]  $\int_0^1 [x + 2]dx$  [5mks]  
     II]  $\int_1^2 4x^{-2} - 2 dx$  [5mks]