



# TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHS AND PHYSICS

## UNIVERSITY EXAMINATION FOR: ANALYTICAL CHEMISTRY [YEAR1 SEM2]

AMA 2103 CALCULUS FOR SCIENCE

### END OF SEMESTER EXAMINATION MAY SERIES

MAY 2016

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. Find  $f'$  from first principles at  $x = 2$  given  $y = 3x^2 + 2x$  [5mks]
- b. Evaluate  $\lim_{x \rightarrow -3} \frac{x^2 - 9}{x + 3}$  [4mks]
- c. Determine the maximum value of  $y$  if  $y = -0.5x^2 + 10x + 10$  [5mks]
- d. Find the gradient to the curve  $Y = \frac{2x-4}{x+2}$  at  $x=0$  use quotient rule [5mks]
- e. Find the equation of a normal to the curve  $y = 2x^3 - 2x + 4$  at  $x=1$  [5mks]

- f. find  $g \circ f$  given  $g(x) = 2x - 2$  and  $f(x) = 3x^2 + 2x + 2$  hence find  $g \circ f(1)$  [6mks]

### QUESTION TWO [20MKS]

- a. Evaluate  $\frac{dy}{dx}$  at  $x=2$  given  $y = \frac{3x+4}{x+2}$  using quotient rule [5mks]
- b. Evaluate  $\int_1^3 [2x + 4] dx$  [4mks]
- c. Investigate the nature of turning points to the curve  $y = x^3 - 12x + 6$  [6mks]
- d. Determine the area under the curve  $y = 2x + 2$  between  $x=0$  and  $x=3$  by integration [5mks]

### QUESTION THREE [20MKS]

- a) Find the  $\int_2^4 [2x + 3x^2 + 3] dx$  [5mks]
- e. A straight line passes through A(3 3) B(9 6) and C (x, 12) find the value of x [5mks]
- f. Determine inverse ( $f^{-1}(x)$ ) given *that*  $f(x) = \frac{x}{x-3}$  [5mks]
- g. determine the turning points of the curve  $y = -2x^3 + 24x + 4$  [5mks]

### QUESTION FOUR (20MKS)

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

### QUESTION FIVE [20MKS]

a) Find  $\frac{dy}{dx}$  at  $x=1$  given

I]  $y = (2x+4)^3$  using substitution [5mks]

II]  $y = \frac{3x+2}{x+1}$  using quotient rule [5mks]

b) Evaluate I]  $\int_1^2 [x - 2] dx$  [5mks]

II]  $\int_2^3 [x^2 + 2x] dx$  [5mks]