
UNIVERSITY OF SWAZILAND



FINAL EXAMINATION, MAY 2017

BA in Social Sciences I

Title of Paper : Elementary Quantitative Techniques II

Course Number : MAT102

Time Allowed : Two (2) Hours

Instructions

1. This paper consists of SEVEN (7) questions in TWO sections.
2. Section A is **COMPULSORY** and is worth 50%. Answer ALL questions in this section.
3. Section B consists of FOUR questions, each worth 25%. Answer ANY TWO (2) questions in this section.
4. Show all your working.
5. Start each new major question (A1, B4 – B7) on a new page and clearly indicate the question number at the top of the page.
6. You can answer questions in any order.

Special Requirements: NONE

THIS EXAMINATION PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS BEEN GIVEN BY THE INVIGILATOR.

Section A

Answer ALL Questions in this section

QUESTION A1

a. Evaluate

i. $\lim_{x \rightarrow 3} (2 + 4x^2 - x^3)$ [2]

ii. $\lim_{x \rightarrow -2} \left(\frac{3x}{5 - 3x} \right)$ [2]

iii. $\lim_{x \rightarrow 4} \left(\frac{x^2 - 4x}{x - 4} \right)$ [3]

iv. $\lim_{x \rightarrow \infty} \left(\frac{x + 7}{x^2 - 2} \right)$ [4]

QUESTION A2a. State the *limit definition* of the derivative of the function $f(x)$. [2]b. Use the limit definition to find $\frac{df}{dx}$ given

$$f(x) = 5 - x^2$$

[7]

c. Find y' if

i. $y = 4 - 2x + \frac{2}{7}x^7$ [2]

ii. $y = 3X^{\frac{3}{5}} + X^{-\frac{4}{3}}$ [3]

iii. $y = 1 - \frac{2}{x^2}$ [3]

iv. $y = e^{2-5x}$ [2]

v. $y = \ln(3x)$ [3]

QUESTION A3

a. State the *Fundamental Theorem of Calculus*. [3]

b. Integrate

i. $\int_0^1 (3 + 4x - 15x^2) dx$ [5]

ii. $\int (7X^{\frac{1}{2}} + \frac{3}{X}) dX$ [3]

iii. $\int \left(\frac{5}{x^5} - \frac{3}{x^4} \right) dx$ [3]

iv. $\int e^{\frac{1}{2}x} dx$ [3]

Section B

Answer and 2 Questions in this section

QUESTION B4

- a. Find the value of the limit of

$$\lim_{x \rightarrow -3} \frac{x+3}{x^2+4x+3}$$

[7]

- b. Find the derivative

i. y' for $y = (1 - 4x^2)^{14}$

[3]

ii. y' for $y = (x+3)e^x$

[4]

iii. y' for $y = \frac{3x-2}{7x+4}$

[6]

iv. y''' for $y = 3\sqrt{x} + \frac{1}{x}$

[5]

QUESTION B5

- a. Consider the function

$$y = 2 + 27x - x^3$$

- i. Find the
- stationary point(s)*
- and classify them as relative maxima or minima.

[10]

- ii. Find the
- y
- intercept.

[2]

- iii. Make a neat sketch of the graph of
- y
- .

[4]

- b. The total costs
- C
- of a company (under certain conditions) are given by

$$C(x) = x^2 + \frac{16000}{x}$$

- where
- x
- is the number of units produced per month. Find the number of units that minimises the monthly average costs. Hence find the minimum cost.

[9]

QUESTION B6

- a. By first making the substitution $u = x^2 + 1$, evaluate the integral

$$\int 6x(x^2 + 1)^5 dx.$$

[10]

- b. Use the method of partial fractions to integrate

$$\int \frac{5x - 6}{(x - 1)(x - 2)} dx.$$

[15]

QUESTION B7

- a. Use the method of tabular integration to evaluate

$$\int 20x^2 e^x dx.$$

[12]

- b. i. Evaluate

$$\int_0^1 \frac{2t^4 - 3t^3 + 5}{t^3} dt.$$

[7]

- ii. Find the area of the shaded region in the figure below

[6]

