
UNIVERSITY OF SWAZILAND



SUPPLEMENTARY EXAMINATION, JULY 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, B2 – 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. $\lim_{x \rightarrow -2} (3x^2 + 6x - 7)$ [2]

ii. $\lim_{x \rightarrow 1} \left(\frac{1+x}{(2x-5)^2} \right)$ [2]

iii. $\lim_{x \rightarrow -1} \left(\frac{x^2 - 1}{x + 1} \right)$ [3]

iv. $\lim_{x \rightarrow -\infty} \left(\frac{2x^2 - 3}{4 - 5x^2} \right)$ [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

$$f(x) = 3x^2 - 2x$$

[7]

c. Find y' if

i. $y = \frac{2}{3}x^6 - 7x^4 - 8$ [2]

ii. $y = 2X^{\frac{1}{5}} + X^{-\frac{6}{5}}$ [3]

iii. $y = 5t^2 - \frac{4}{\sqrt{t}}$ [3]

iv. $y = e^{3x+2}$ [2]

v. $y = \ln(3 - 5x)$ [3]

QUESTION A3

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

b. Integrate

i. $\int_{-1}^2 (4x - 8x^2) dx$ [5]

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

iii. $\int \left(\frac{12}{x^3} - \frac{20}{x^7} \right) dx$ [3]

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

Section B

Answer and 2 Questions in this section

QUESTION B4

a. Find the value of the limit of

$$\lim_{x \rightarrow -2} \frac{x^2 - x - 6}{x^2 + 3x + 2}$$

[7]

b. Find the derivative

i. y' for $y = (x - x^3)^5$

[3]

ii. y' for $y = (5x + 7)e^{-3x}$

[4]

iii. y' for $y = \frac{1 - t^2}{5 + t^3}$

[6]

iv. y''' for $y = 4x + \frac{3}{x}$

[5]

QUESTION B5

a. Consider the function

$$y = x^2 - 4x + 3$$

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 profit P of a company is given by

$$P(x) = 75x - 0.03x^2 - 5400,$$

i. find the profit if the monthly sales stand at 200 units.

[3]

ii. find the number of units that maximises the profit. Hence find the maximum profit.

[6]

QUESTION B6

- a. By first making the substitution $u = 3 - x^2$, evaluate the integral

$$\int 8x(3 - x^2)^{-2} dx.$$

[10]

- b. Use the method of partial fractions to integrate

$$\int \frac{3x - 2}{x(x - 2)} dx.$$

[15]

QUESTION B7

- a. Use the method of tabular integration to evaluate

$$\int 12x^2 e^{2x} dx.$$

[12]

- b. i. Evaluate

$$\int_0^1 \left(\frac{2}{3\sqrt{x}} + x^{3/2} + 6 \right) dx$$

[7]

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

[6]

