
University of Swaziland



Supplementary Examination – July 2009

Dip. Env. Health I, Dip. Env. Health IV

Title of Paper : Algebra for Health Sciences

Course Number : HSM111

Time Allowed : Two (2) hours

Instructions :

1. This paper consists of SIX questions.
2. Each question is worth 25%.
3. Answer ANY FOUR questions.
4. Show all your working.

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

Question 1

(a) Express

$$4 \log \sqrt{x} + 2 \log x - \frac{3}{2} \log x^2$$

as a single term.

(b) Find the eleventh term of the expansion of $\left(2x^2 - \frac{1}{x}\right)^{16}$.

(c) Find all real roots of $x^3 - 3x^2 + 4 = 0$.

Question 2

(a) Solve for x

i. $4^x = 8^{1-2x}$

ii. $\log_3(x^2 - 9) = 3$

(b) Expand

$$\left(2a - \frac{b}{a^2}\right)^5$$

and simplify term by term.

(c) Find the value of the infinite sum

$$16 + 8 + 4 + \dots$$

Question 3

(a) Given the formula

$$V = K(1 - e^{-\frac{n}{m}t}),$$

make t the subject of the formula.

(b) Consider the matrices

$$A = \begin{pmatrix} 2 & 0 & 1 \\ -1 & 2 & 1 \\ 1 & -1 & 4 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & -1 & 1 \\ -2 & 0 & 0 \\ -1 & 3 & 1 \end{pmatrix}.$$

Work out

- i. BA ,
- ii. $|A|$.

Question 4

- (a) Find the exact value of $\cos(-1965^\circ)$.
- (b) The fourth and ninth terms of an arithmetic progression are -23 and 12 , respectively. Find the first 2 terms.
- (c) Find the centre and radius of the circle

$$x^2 + y^2 - 10x - 11 = 0.$$

Question 5

- (a) Use the quadratic formula to solve

$$x^2 + 2x + 5 = 0. \quad [8 \text{ marks}]$$

- (b) Evaluate

$$\frac{20 + 20i}{(2i - 1)^2}$$

and express your answer in the form $a + ib$.

- (c) Simplify

$$\sin(A + 30^\circ) + \cos(A - 60^\circ).$$

Question 6

(a) Solve for x given

$$\begin{vmatrix} x & 1 \\ x & x \end{vmatrix} = 12.$$

[12 marks]

(b) Evaluate

$$(1 + i)(1 + 2i)(1 + 3i)$$

and express your answer in the form $a + ib$.

(c) Use synthetic division to evaluate

$$(x^4 - 8) \div (x - 2).$$
