

α -MATHEMATICS

Alpha Mathematics

March test 2024

Grade 10

Time: 1 hour

Examiner: Pieter van Onselen

Total: 50 marks

Moderator: Lanice Liebenberg

INSTRUCTIONS AND INFORMATION

Read through the following instructions before answering the question paper.

1. This question paper consists of 3 pages and an answer sheet of 2 pages.
2. Answer ALL 4 questions.
3. Number the answers according to the numbering system used in this question paper.
4. Non-programmable calculators may be used, unless otherwise indicated in the question.
5. Unless indicated otherwise, all answers, must be given correct to two decimal places, where necessary.
6. Clearly show all calculations, diagrams, graphs etcetera that you have used in determining the answers.
7. Answers only will not necessarily be awarded full marks.
8. The diagrams in the question paper are not necessarily drawn to scale.
9. All angles are given in radians. Answers must also be given in radians where necessary.
10. Write neatly and legibly.

Question 1**[10 marks]**

This question must be answered on the **answer sheet**.

Every question has **ONLY** one correct answer for TWO marks each. Mark the correct answer with an **X** on the answer sheet.

1.1 Simplify $-\frac{2}{i}$:

- (A) 2 (B) $\frac{2}{i}$
(C) $\frac{2}{i^2}$ (D) $2i$

1.2 Which of the following is an identity matrix?

- (A) $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$ (B) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
(C) $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$ (D) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

1.3 The conjugate of $2i - 1$ is:

- (A) $2i + 1$ (B) $-1 - 2i$
(C) $-2i + 1$ (D) $-1 + 2i$

1.4 Given the partial fraction: $\frac{-x-2}{x^2(x+1)} \equiv \frac{A}{x} + \frac{B}{x^2} + \frac{C}{(x+1)}$

Multiplying with the LCM gives: $-x - 2 \equiv Ax^2 + Ax + Bx + B + Cx^2$

Given $B = -2$, determine A :

- (A) $A = -1$ (B) $A = 0$
(C) $A = 1$ (D) $A = -2$

1.5 A complex number is imaginary only if it contains no real numbers.

Determine the value of a so that $i(1 + ai) + 1$ will be imaginary only.

- (A) -1 (B) 0
(C) i (D) 1

Question 2**[19 marks]**

- 2.1 Determine $\sqrt{-64}$ (2)
- 2.2 Determine the value of:
- (a) $(1 - i) - (3 + 2i)$ (2)
- (b) $i^{41}(-1 + 5i)$ (3)
- (c) $\text{Re}(2 - i)^2$ (4)
- (d) $\frac{1}{3-i}$ (4)
- 2.3 Calculate $(2 - 3i) + (1 + 2i)$ graphically on the answer sheet **DIAGRAM 1**. (4)

Question 3**[9 marks]**

Decompose $\frac{3x^2+2x+2}{(x+1)^2(x-2)}$ into partial fractions. (9)

Question 4**[12 marks]**

- 4.1 Given the matrices $A = \begin{pmatrix} 1 & -1 \\ 3 & -4 \end{pmatrix}$, $B = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$ and $C = \begin{pmatrix} 0 & 2 \\ 1 & -1 \end{pmatrix}$. If possible do the following calculations. If not possible explain why.
- (a) $B \times A$ (2)
- (b) $C - A$ (2)
- (c) $B + A$ (2)
- (d) $A \times B$ (2)
- (e) C^T (1)
- 4.2 Given the matrices $\begin{pmatrix} 2 & -2 \\ 4 & 6 \end{pmatrix} = 2 \begin{pmatrix} 1 & b \\ a & 3 \end{pmatrix}$.
Determine the values of a and b . (3)

- END OF QUESTION PAPER -

- EMPTY PAGE -

Alpha Mathematics Grade 10 - March test 2024**ANSWER SHEET**

Name and Surname: _____

Question Total	1 [10]	2 [19]	3 [9]	4 [12]	TOTAL 50
Learner mark					

Question 1

1.1	A	B	C	D
1.2	A	B	C	D
1.3	A	B	C	D
1.4	A	B	C	D
1.5	A	B	C	D

DIAGRAM SHEET 1

