α-MATHEMATICS

Grade 10 Alpha Mathematics

Term 3 Test 2023

Examiner: Lanice Liebenberg **Time: 90 minutes**

Moderator: Rika Grobler **Total: 80**

INSTRUCTIONS AND INFORMATION

Read through the following instructions before answering the question paper.

1. This question paper consists of 5 pages, an answer sheet and a diagram sheet.
2. Answer ALL 5 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, where necessary, must be given correct to two decimal places.
6. Cleary 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 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. Mark the correct answer with an **X** on the answer sheet.

1.1 $\frac{2\pi}{5}$ radians = (2)

A $\frac{1}{450}°$

B $144°$

C $36°$

D $72°$

1.2 Given that $y = ax^n$ then $y' =$ (2)

A nx^a

B ax^{n-1}

C anx^{n-1}

D $(a-1)x^n$

1.3 Coordinates $A(1\,;\,-2)$ and $B(3\,;1)$ on f are given as well as $C(1\,;3)$ and $D(-2\,;1)$ on g. Then $(g \circ f)(1) =$ (2)

A 1

B -2

C 3

D 4

1.4 If $h(a) = 2ax^2$ then $h'(a) =$ (2)

A $4ax$

B $2a$

C $2x^2$

D $2a^2x$

1.5 If $f(x) = x^2$ and $g(x) = \sqrt{x^2}$ then: (2)

A $(f \circ g)(x) = x^4$

B $(f \circ g)(x) = x^2$

C $(f \circ g)(x) = \sqrt{x}$

D $(f \circ g)(x) = x$

Question 2 **[36 marks]**

2.1 Given that $f(x) = \frac{4}{x^4} - \sqrt{x-1} + \frac{x+1}{2}$ and $g(x) = 2x + 1$ determine and simplify each of the following:

2.1.1 $(f \circ g)(x)$ (4)

2.1.2 $(g \circ g)(x)$ (3)

2.1.3 $(g \circ f)(x)$ (3)

2.2 Determine f and g if:

2.2.1 $(f \circ g)(x) = \sqrt[3]{x^2+6} + \frac{1}{x^2+6}$ (3)

2.2.2 $(f \circ g)(x) = 7(x-1)^4 - \frac{3}{(x-1)^2} - 1 + x$ (4)

2.3 Sketch the following piecewise function. (9)

$$f(x) = \begin{cases} 3x + 15 & ; \quad x < -2 \\ 2x^2 + 1 & ; \quad -2 \leq x < 0 \\ -3 & ; \quad x = 0 \\ 2^x + 1 & ; \quad 0 < x < 2 \\ -x + 1 & ; \quad x \geq 2 \end{cases}$$

2.4 Sketch the graphs of $g(x) = 2\cos x + 1$ and $h(x) = \tan x$ on the same set of axis. (6)

2.5 Determine each of the following, answers must be given in radians:

2.5.1 $\tan \frac{\pi}{6}$ (2)

2.5.2 $\arcsin \frac{1}{\sqrt{2}}$ (2)

Question 3 **[15 marks]**

Determine each of the following derivatives:

3.1 $g(x) = 4y^2 - 6y + 7$ (2)

3.2 $f(x) = 3x\left(\frac{1}{\sqrt{x}} - x\right)^2$ (5)

3.3 $k(x) = \frac{5}{\sqrt{x}} + \frac{3}{x^4} + 2x$ (4)

3.4 $b(x) = 3(x^7 - 10x)^{100}$ (4)

Question 4 **[14 marks]**

Determine each of the following integrals:

4.1 $\int (5x^4 + 7 - 3x^2)\, dx$ (4)

4.2 $\int (15x^2 + 7)^{13} dx$ (4)

4.3 $\int_1^2 \left(\frac{2}{x^2} - 5x^5\right)\, dx$ (6)

Question 5 **[5 marks]**

Given:

$f(x) = \sqrt{x}$ and $g(x) = x^2 - \frac{7}{2}x$

Determine the area between the graphs with intersections at $(0\,;\,0)$ and $(4\,;\,2)$.

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Term 3 Test 2023 Answer sheet

Name and Surname: _____

Question Total	1 [10]	2 [36]	3 [15]	4 [14]	5 [5]
Learner mark					

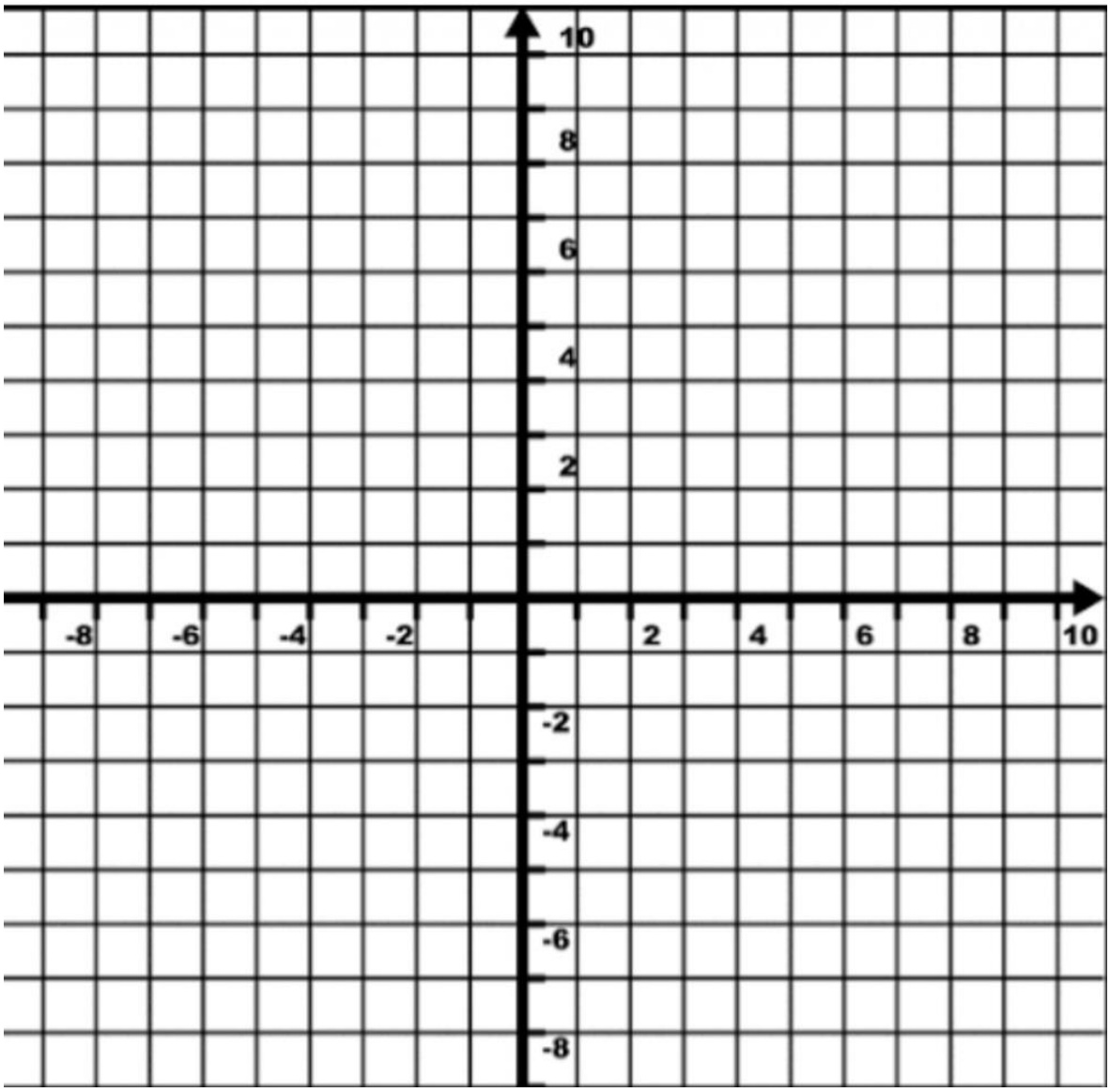
TOTAL 80

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

Question 2

2.3



2.4