α-MATHEMATICS

Grade 10 Alpha Mathematics

Term 3 Test 2022

Examiner: Lanice Liebenberg **Time: 2 hours**

Moderator: Anna Muller **Total: 100**

INSTRUCTIONS AND INFORMATION

Read through the following instructions before answering the question paper.

1. This question paper consists of 7 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 [20 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 Given that $f(3) = 5$ and $g(x) = x^2 + 3$ which of the following statements is true? (2)

A $(f \circ g)(5) = 28$

B $(g \circ f)(3) = 28$

C $(f \circ g)(3) = 28$

D $(g \circ f)(5) = 28$

1.2 Which of the following statements is false? (2)
A derivative is:

A The area between a graph and the $x-$ axis.

B Rate of change.

C Gradient at a certain point.

D An important application in optimization.

1.3 Given that $f(x) = \frac{1}{x^2}$ then (2)

A $f'(x) = -\frac{2}{x^3}$

B $f'(x) = -2x^{-1}$

C $f'(x) = \frac{2}{x^3}$

D $f'(x) = 2x^{-1}$

1.4 If $f'(x) = 3x^2$ then the following statement is false: (2)

A $f(x) = x^3 + 5$

B $f(x) = x^3 - 1$

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

D $f(x) = x^3$

1.5 If $f(x) = -2x^2 + x$ and $g(x) = 2x - 1$ then: (2)

A $(f \circ g)(x) = -2(2x - 1)^2 + x$

B $(g \circ f)(x) = -2(2x - 1)^2 + x$

C $(f \circ g)(x) = -8x^2 + 10x - 3$

D $(g \circ f)(x) = -8x^2 + 6x - 3$

1.6 Which of the following statements is true? (2)

A $f'(x)$ denotes the integral of a function.

B $\int f(x)dx$ denotes the gradient of a function at a specific point.

C $f'(x)$ denotes the gradient of a function at a specific point.

D $\int f(x)dx$ denotes the derivative of a function.

1.7 Given that $f(x) = \frac{1}{x^2}$ then (2)

A $\int f(x)dx = -2x^{-3} + c$

B $\int f(x)dx = -\frac{1}{x} + c$

C $\int f(x)dx = -2x^{-1} + c$

D $\int f(x)dx = \frac{1}{x^{-1}} + c$

1.8 Which of the following is defined as a definite integral? (2)

A $\int 2\ dx$

B $\int x\ dx$

C $\int 2x^3\ dx$

D $\int_{-1}^{2} 2x^3\ dx$

1.9 A relation is a function if: (2)

A It is one-to-many.

B It is one-to-one.

C For every x value there is more than 1 y value.

D None of the above.

1.10 Which of the following graphs is not a function? (2)

A A parabola.

B A straight line.

C A circle

D A Hyperbola

Question 2 **[27 marks]**

2.1 Given that $f(x) = \sqrt{x+5}$ and $g(x) = \frac{1}{x}$ determine and simplify each of the following:

2.1.1 $(f \circ g)(x)$ (2)

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

2.1.3 $(g \circ f)(4)$ (3)

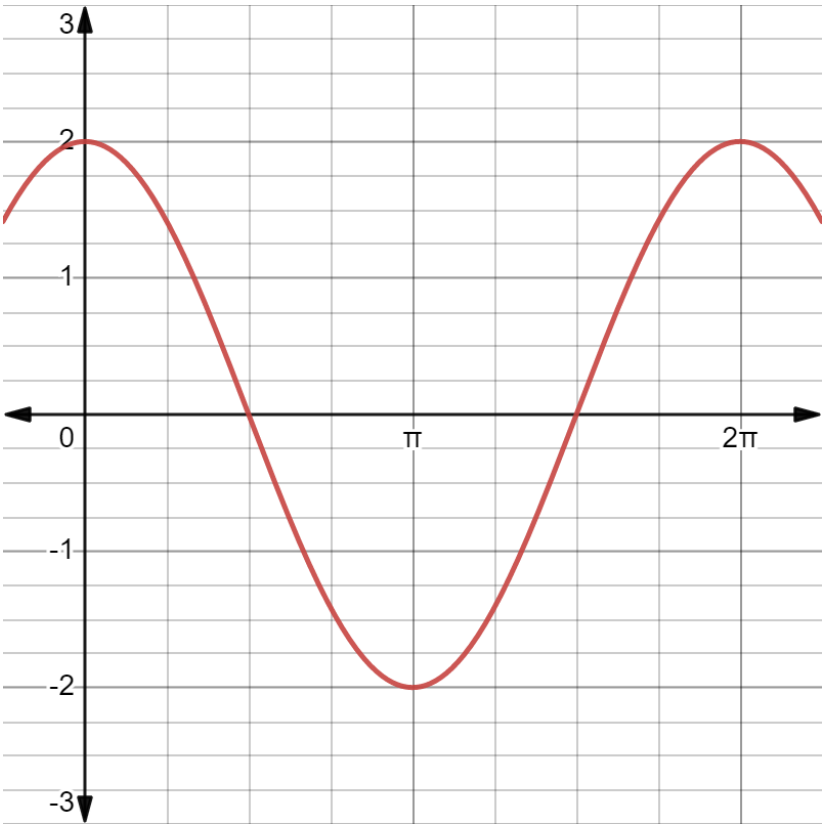
2.1.4 $f(-6)$ (hint: make use of complex numbers) (3)

2.2 Given that $(f \circ g)(x) = \sqrt{x^2-2} + \frac{1}{\sqrt{x^2-2}}$ determine f and g. (4)

2.3 Sketch the following piecewise function. (6)

$$h(x) = \begin{cases} x^2 & if \quad x < 0 \\ 2x & if \quad 0 < x < 2 \\ 4 - x & if \quad x \geq 2 \end{cases}$$

2.4 Given the diagram below, determine the equation of the graph: (2)



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

2.5.1 $\sin\frac{\pi}{3}$ (2)

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

Question 3 [17 marks]

Determine each of the following derivatives, leave your answer with positive exponents in simplest surd form:

3.1 $g(x) = 10x^{15} - 3x^4 + 2x - 10$ (4)

3.2 $f(x) = (6x - 3)^4$ (4)

3.3 $k(x) = \frac{10}{x^5} + 3\sqrt{x}$ (4)

3.4 $b(x) = \frac{3}{(5x^3+2x^2+5)^3}$ (5)

Question 4 [25 marks]

Determine each of the following integrals:

4.1 $\int (10\sqrt[3]{x} - \pi)\, dx$ (4)

4.2 $\int (t^4 + x^2 t - 3xv^5) dt$ (4)

4.3 $\int 7x^5\, dx$ (2)

4.4 $\int_{-1}^{3} x^2\, dx$ (4)

4.5 $\int_{1}^{2} (3x - 1)^2\, dx$ (6)

4.6 $\int_{2}^{4} \frac{1}{x^3} dx$ (5)

Question 5 [11 marks]

5.1 Determine the area between the graph and the x −axis given that the domain is $x \in [0; 4]$ and the graph is defined by $y = 4x^3 + 3x^2 + 2x + 1$. (6)

5.2 Determine the volume of the rotating body which forms when the area of $y = 4\sqrt{x^3 + 1}$ rotates around the x-axis for $x \in [0\,; 2]$. (5)

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Term 3 Test 2022 Answer sheet

Name and Surname: _____

Question Total	1 [20]	2 [27]	3 [17]	4 [25]	5 [11]
Learner mark					

TOTAL 100

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
1.6	A	B	C	D
1.7	A	B	C	D
1.8	A	B	C	D
1.9	A	B	C	D
1.10	A	B	C	D

Question 2

2.3