

α -MATHEMATICS

Grade 11 Alpha Mathematics Term 3 Test 2021

Examiner: L Liebenberg

Time: 1 hour

Moderator: A Muller

Total: 65

INSTRUCTIONS AND INFORMATION

Read through the following instructions before answering the question paper.

1. This question paper consists of 5 pages and an answer 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. 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 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 Two vectors are equal if: (2)

- A they have the same direction.
- B they are parallel
- C they have equal magnitude.
- D they have the same direction and equal magnitude.

1.2 Two vectors are parallel if: (2)

- A they are equal in length.
- B their dot product equals to zero.
- C their cross product equals to zero.
- D they have the same direction.

1.3 If the limit of a function exists, but $\lim_{x \rightarrow a} f(x) \neq f(a)$ it is called a (2)

- A jump discontinuity.
- B removable discontinuity.
- C Asymptotic discontinuity.
- D None of the above.

- 1.4 The gradient of a function at a point is called the (2)
- A integral of the function.
 - B roots of the function.
 - C derivative of the function.
 - D constant of the function.
- 1.5 Given $f(x) = \sin^2(5x)$, then $f'(x) =$ (2)
- A $10 \sin(5x) \cdot \cos(5x)$
 - B $2\sin(5x)$
 - C $2\cos(5x) \cdot 5$
 - D $10 \sin(5x) \cdot \cos(x)$

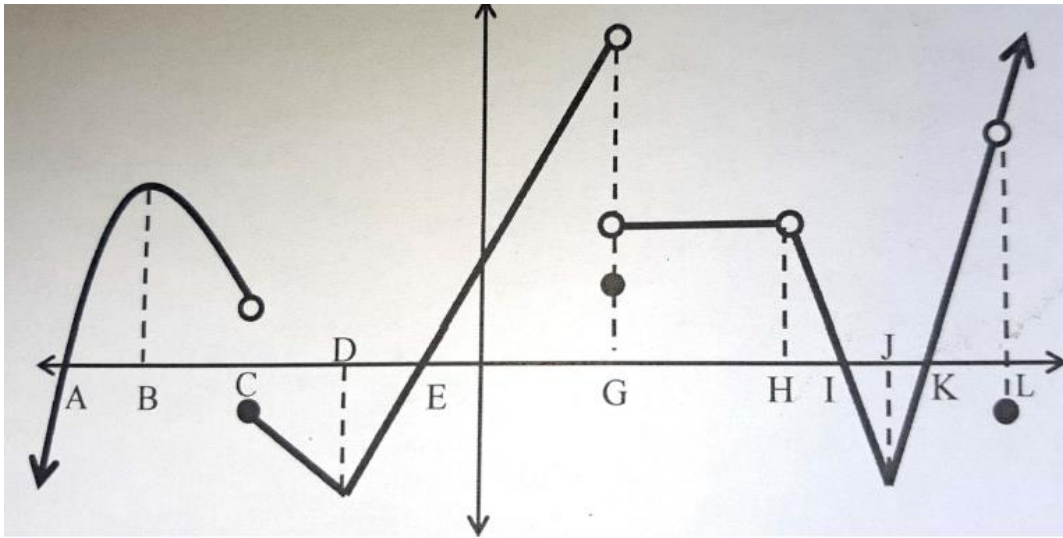
Question 2**[21 marks]**

Given the vectors $P = 2i - 2j + 4k$, $Q = (-1; 5; -3)$ and $R = (x; 8; 3)$ answer the questions below:

- 2.1 Determine the magnitude of P. (2)
- 2.2 $2P + Q$ (3)
- 2.3 $P \times Q$ (4)
- 2.4 Determine the angle between P and Q. (6)
- 2.5 Determine x if, P and R are perpendicular. (3)
- 2.6 Determine the area of the parallelogram formed by P and Q. (3)

Question 3**[11 marks]**

Given the function $f(x)$ sketched below. State for which values of x :



- 3.1 The left and right limits are not equal. (2)
- 3.2 Where f is undefined. (2)
- 3.3 Where f has a removable discontinuity. (2)
- 3.4 Where f has a jump discontinuity. (2)
- 3.5 Where f is not differentiable. (3)

Question 4**[14 marks]**

Determine the derivative of each question below.

- 4.1 $f(x) = (x^4 - 1)(x^3 - 1)$ (3)
- 4.2 $D_x \left[\left(\sqrt[4]{x} + \frac{1}{\sqrt{x}} \right)^3 \right]$ (4)
- 4.3 $\frac{d}{dx} (x^4 \cos x)$ (3)
- 4.4 $\frac{d}{da} \left(\frac{\tan a}{2a+1} \right)$ (4)

Question 5**[9 marks]**

Determine the integral of each question below.

$$5.1 \quad \int \frac{1}{1+(3-x)^2} \quad (4)$$

$$5.2 \quad \int \frac{5}{x^3} - 4x^6 + 5 \, dx \quad (5)$$

- END OF QUESTION PAPER -

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Grade 11 Alpha Mathematics Term 3 Test 2021 Answer sheet

Name and Surname: _____

Question Total	1 [10]	2 [21]	3 [11]	4 [14]	5 [9]	TOTAL 65
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

Formula Sheet

Vectors

$ AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$	$\mathbf{u} \times \mathbf{v} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ u_1 & u_2 & u_3 \\ v_1 & v_2 & v_3 \end{vmatrix}$
$\mathbf{u} \cdot \mathbf{v} = \mathbf{u} \mathbf{v} \cos\theta$ $\mathbf{u} \cdot \mathbf{v} = x_1 \cdot x_2 + y_1 \cdot y_2 + z_1 \cdot z_2$	$ OP = \sqrt{a^2 + b^2 + c^2}$ $\alpha = \frac{bg \cos\left(\frac{u_1}{ u }\right)}{\dots}$

Calculus

$\int_a^b x^n = \left[\frac{x^{n+1}}{n+1} \right]_a^b$

Table of derivatives

$F(x)$	$F'(x)$
ax^n	nax^{n-1}
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\operatorname{cosec} x$	$-\operatorname{cosec} x \cdot \cot x$
$bg \sin x$ $\arcsin x$	$\frac{1}{\sqrt{1-x}}$
$bg \cos x$ $\arccos x$	$\frac{-1}{\sqrt{1-x}}$
$bg \tan x$ $\arctan x$	$\frac{1}{x^2 + 1}$
$f(x) \cdot g(x)$	$f'(x) \cdot g(x) + f(x) \cdot g'(x)$
$\frac{f(x)}{g(x)}$	$\frac{f'(x) \cdot g(x) - f(x) \cdot g'(x)}{[g'(x)]^2}$
$f[g(x)]$	$f'[g(x)] \cdot g'(x)$