



Year 11 IBDP Mathematics Analysis and Approaches SL – Paper 1

EXAMINATION

Semester 1 2020

St Leonard's College

An education for life.

Question and Answer Booklet

STUDENT NAME: _____

TEACHER(S): Mr. Biller Mr. Rodgers

TIME ALLOWED: Reading time 5 minutes

Writing time 90 minutes

INSTRUCTIONS

- Do not open this examination paper until instructed to do so.
- You are not permitted access to any calculator for this paper.
- Section A: answer all questions. Answers must be written within the answer boxes provided.
- Section B: answer all questions in the answer booklet provided. here
- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
- A clean copy of the mathematics: analysis and approaches formula booklet is required for this paper.
- The maximum mark for this examination paper is [79 marks]. ions for the exam here

STRUCTURE OF BOOKLET / MARKING SCHEME

Exam Section	Number of questions to be answered	Total marks
Section A	ALL	55
Section B	ALL	24

Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

Section A

Answer all questions. Answers must be written within the answer boxes provided. Working may be continued below the lines, if necessary.

1. [Maximum mark: 13]

For each of the following equations, solve for x . Leave your answers as exact values.

(a) $x^2 - 7x = -12$

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(b) $3^{x-2} = \frac{1}{81}$

[2 marks]

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(c) $\log_5\left(\frac{1}{25}\right) + \log_5(x-1) + 3 = 0$

[3 marks]

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(d) $100^x - 11 \times 10^x + 10 = 0$

[4 marks]

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[4 marks]

2. [Maximum mark: 6]

The following table shows four series of numbers.

(a) Complete the table by stating the type of series that is shown: arithmetic, geometric or neither.

Series		Type of series
(i)	$1 + 11 + 121 + 1331 + 14641 + \dots$	
(ii)	$\frac{1}{4} + \frac{1}{3} + \frac{5}{12} + \frac{1}{2} + \dots$	
(iii)	$-\pi + 0 + \pi + 2\pi + \dots$	
(iv)	$10 + 5 + 2.5 + 1.25 + \dots$	

(b) Can the sum to infinity be found for any of these series? If so, find its sum.

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[4+2 = 6 marks]

3. [Maximum mark: 7]

(a) A series is generated by the following rule $\sum_{n=2}^{\infty} (3^{n-1})$.

(i) Write down the first four terms

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[3 marks]

(ii) Show, using a test, that the series generated is either arithmetic, geometric or neither.

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[2 marks]

(b) Write the following series in sigma notation form:

$$14 + 11 + 8 + 5 + \dots$$

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[2 marks]

4. [Maximum mark: 9]

(a) Use the Completing the Square Method and hence write down the co-ordinates of the vertex for $y = 3x^2 - 6x - 1$

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[6 marks]

(b) Find the x-intercepts of $y = 3x^2 - 6x - 1$

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[3 marks]

5. [Maximum mark: 12]

(a) On the grid below, sketch **both** the graph of $f(x) = 2^x - 1$ **and** $g(x) = \log_2(x + 1)$.

Show your working to find:

- (i) co-ordinates of any intercepts, and
- (ii) equations of asymptotes.

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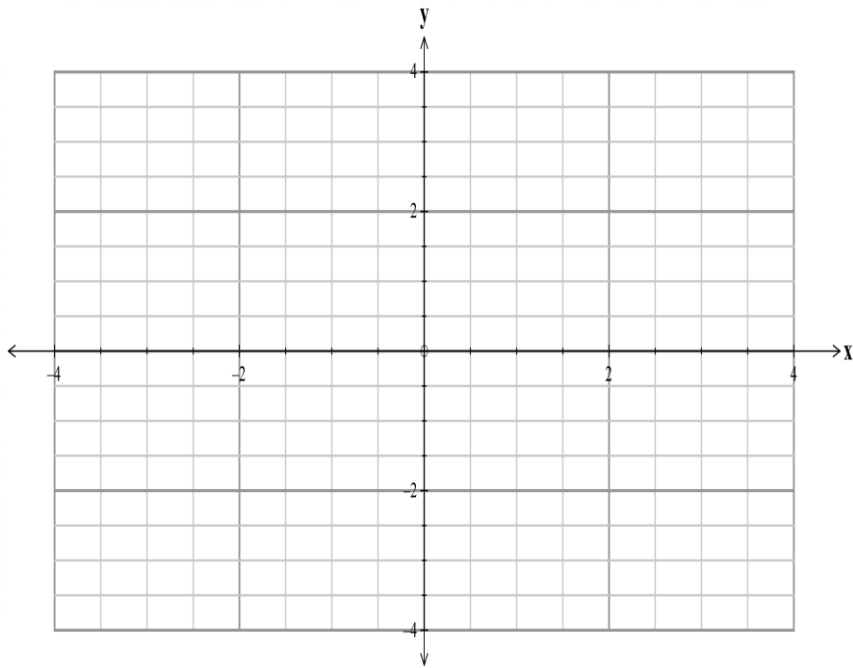
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[10 marks]

This question continues on the next page.

(b) Write down co-ordinates of where $f(x) = g(x)$.

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[2 marks]

6. [Maximum mark: 8]

For the following questions $f(x) = x^2 + 2$, $x \geq 0$ and $g(x) = \sqrt{x - 2}$

(a) Evaluate:

(i) $f(2)$

(ii) $g(2)$

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[2 marks]

(b) Find $f \circ g(x)$

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[4 marks]

(c) Hence state $g \circ f(x)$ and explain whether or not $f(x)$ and $g(x)$ are inverse functions of each other

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[2 marks]

Do not write solutions on this page.

Section B

Answer all questions in the answer booklet provided. Please start each question on a new page.

7. [Maximum mark: 7]

Consider $h(x) = 18 + 2x^2 - 4mx$, for $m \neq 0$. The equation $h(x) = 0$ has two repeated roots.

(a) Find the value(s) of m .

[5 marks]

(b) What is the range of $h(x)$ for your value(s) of m in part (a).

[2 marks]

8. [Maximum mark: 9]

Let $f(x) = \log_2(\sqrt[3]{x^2})$, for $x > 0$.

(a) Show that $f^{-1}(x) = (2^3)^{0.5x}$.

[4 marks]

(b) Write down the range of f^{-1} .

[1 mark]

Let $g(x) = \log_2 x$, for $x > 0$.

(c) Find the value of $(g \circ f^{-1})(4)$, giving your answer as an integer.

[4 marks]

9. [Maximum mark: 8]

(a) Solve $x^2 - 5x + 2 = x - 3$ for all $x \in R$.

[2 marks]

(b) Hence find the co-ordinates of the vertex of $f(x) = x^2 - 6x + 5$

[2 marks]

(c) $f(x)$ is transformed in order by the following transformations to become $g(x)$:

(i) a translation 3 units to the left

(ii) a translation 3 units to the up

(iii) a horizontal reflection

(iv) a vertical dilation by factor of two

Show working to find an equation for $g(x)$.

[4 marks]