Topic : All Topics
Total Marks : 56 Total Time : 75 mins
GDC allowed for : Q2, Q6, Q7, Q10 GDC NOT allowed for :Q1, Q3, Q4, Q5, Q8, Q9

Prior to starting the test, please take a moment to carefully review the following instructions:

1. On the first page please mention your name, start time, and end time of the test and share your answer sheet as a single pdf.
2. To create a realistic test environment, ensure that you are live on Zoom during the test, for that you must use the Zoom app not web version. Keep your video camera turned on and share your entire desktop.
3. **IMPORTANT:** If you encounter any questions that haven't been covered in class yet or fall outside the test syllabus, no need to worry. Just skip that question and mention 'NA', and your grades will be based on the questions you attempted.
4. Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
5. You are allowed to use the official IB formula booklet for all tests

1. Consider the arithmetic sequence 8, 26, 44, ...

(a) Find an expression for the n^{th} term.

(1)

(b) Write down the sum of the first n terms using sigma notation.

(1)

(c) Calculate the sum of the first 15 terms.

(2)

(Total 4 marks)

2. A geometric sequence has a first term of 2 and a common ratio of 1.05. Find the value of the smallest term that is greater than 500.

(Total 5 marks)

3. Determine the first three terms in the expansion of $(1-2x)^5(1+x)^7$ in ascending powers of x.

(Total 5 marks)

4. Express $\dfrac{1}{\left(1-\mathrm{i}\sqrt{3}\right)^3}$ in the form $\dfrac{a}{b}$ where $a, b \in \mathbb{Z}$.

(Total 5 marks)

5. Let $f(x) = \frac{x+4}{x+1}$, $x \neq -1$ and $g(x) = \frac{x-2}{x-4}$, $x \neq 4$. Find the set of values of x such that $f(x) \leq g(x)$.

(Total 6 marks)

6. When $\left(1+\frac{x}{2}\right)^n$, $n \in \mathbb{N}$, is expanded in ascending powers of x, the coefficient of x^3 is 70.

(a) Find the value of n.

(5)

(b) Hence, find the coefficient of x^2.

(1)

(Total 6 marks)

7. A sum of \$ 5000 is invested at a compound interest rate of 6.3 % per annum.

(a) Write down an expression for the value of the investment after n full years.

(1)

(b) What will be the value of the investment at the end of five years?

(1)

(c) The value of the investment will exceed \$10 000 after n full years.

(i) Write an inequality to represent this information.

(ii) Calculate the minimum value of n.

(4)

(Total 6 marks)

8. The polynomial $f(x) = x^3 + 3x^2 + ax + b$ leaves the same remainder when divided by $(x - 2)$ as when divided by $(x + 1)$. Find the value of a.

(Total 6 marks)

9. The functions f and g are defined by $f : x \mapsto e^x$, $g : x \mapsto x + 2$.

Calculate

(a) $f^{-1}(3) \times g^{-1}(3)$;

(3)

(b) $(f \circ g)^{-1}(3)$.

(3)

(Total 6 marks)

10. (a) Sketch the curve $y = |\ln x| - |\cos x| - 0.1$, $0 < x < 4$ showing clearly the coordinates of the points of intersection with the x-axis and the coordinates of any local maxima and minima.

(5)

(b) Find the values of x for which $|\ln x| > |\cos x| + 0.1$, $0 < x < 4$.

(2)

(Total 7 marks)