ANGLO-CHINESE JUNIOR COLLEGE JC1 MID-YEAR ASSESSMENT

Higher 1

CANDIDATE NAME		
TUTORIAL/ FORM CLASS		

MATHEMATICS

Paper 1

8865/01

30 June 2023 1 hour

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number, class and name on all the work you hand in. Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs. Do not use staples, paper clips, glue or correction fluid.

Answer all the questions.

Write your answers in the spaces provided in the Question Paper. Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

You are expected to use an approved graphing calculator.

Unsupported answers from a graphing calculator are allowed unless a question specifically states otherwise.

Where unsupported answers from a graphing calculator are not allowed in a question, you are required to present the mathematical steps using mathematical notations and not calculator commands.

You are reminded of the need for clear presentation in your answers.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 35.

Summary of Areas for Improvement				
Knowledge (K)	Careless Mistakes (C)	Read/Interpret Qn wrongly (R)	Presentation (P)	

This document consists of **10** printed pages.



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Question	Marks
1	/4
2	/5
3	/6
4	/6
5	/9
6	/5

2

1 Do not use a calculator in answering this question.

Given the equation $3\log_x 5 - \frac{2}{\log_x 5} = 5$, use an appropriate substitution to find the exact values of *x*. [4]

- Find the range of values of *m* for which the straight line 2x + y = -1 intersects the curve y = x² mx + 8 at two distinct points. Hence, state the values of *m* for which the straight line 2x + y = -1 is tangent to the curve y = x² mx + 8.
- 3 The diagram shows the outline of a garden which is formed by removing the smaller semicircle with diameter *BC* from a bigger semicircle with diameter *AD*. The length of AB = CD = x m and the length of AD = y m. The total area of the garden is 14π m².



(i) Show that
$$xy - x^2 = 28$$
. [2]
(ii) Given that the perimeter of the garden is 10π m, show that $y = 10 + x - \frac{2}{\pi}x$. [1]

[3]

- (iii) Using (i) and (ii), find the values of x and y.
- 4 Differentiate each of the following expressions with respect to *x*, simplifying your answers.

(i)
$$\left(\frac{2x-e}{\sqrt{x}}\right)^2$$
 [3]

(ii)
$$e^{2-5x} + \sqrt{4-3x}$$
 [3]

- 5 A curve C has equation $y = -3 + \frac{6}{2-x}$.
 - (i) Sketch the graph of *C*, indicating clearly the equations of any asymptotes and axial intercept(s).
 - (ii) Find the equation of the tangent to *C* at the point where $x = 2 + \sqrt{6}$, giving your answer in the form y = mx + c, where *m* and *c* are exact constants to be determined. [3]
 - (iii) Another curve *D*, has equation $y = \ln(ax+b)$, where *a* and *b* are non-zero constants. Given that curves *C* and *D* have a common asymptote, and curve *D* cuts the *x*-axis at $x = \frac{9}{4}$, determine the values of *a* and *b*. [3]
- 6 A durian retailer wants to predict the daily profit from the sales of durian that he can make over a year. As durian is a seasonal fruit, its profit is modelled by

$$P = 2(t-5)^{4} + (5-2t)^{3} - 15t^{2} + 470t - 925, \quad \text{for } 2 \le t \le 12,$$

where *P*, in dollars, is the profit at time *t* months.

- (i) Find P when t = 2. [1]
- (ii) Sketch the graph of *P* against *t*, for $2 \le t \le 12$, stating the coordinates of the turning points correct to 3 decimal places. [2]
- (iii) Given that the retailer will open for business only on months whereby he is able to achieve a predicted daily profit of at least \$500, find the set of values of *t* where he will open for business.