

Surname	Centre Number	Candidate Number
First name(s)		2



GCE A LEVEL

1300U30-1



S25-1300U30-1

WEDNESDAY, 4 JUNE 2025 – MORNING

MATHEMATICS – A2 unit 3
PURE MATHEMATICS B

2 hours 30 minutes

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- a Formula Booklet;
- a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The maximum mark for this paper is 120.

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

Sufficient working must be shown to demonstrate the **mathematical** method employed.

Answers without working may not gain full credit.

Unless the degree of accuracy is stated in the question, answers should be rounded appropriately.

You are reminded of the necessity for good English and orderly presentation in your answers.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	11	
2	12	
3	6	
4	6	
5	8	
6	8	
7	5	
8	5	
9	4	
10	3	
11	10	
12	7	
13	11	
14	11	
15	7	
16	6	
Total	120	



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Reminder: Sufficient working must be shown to demonstrate the **mathematical** method employed.

1. (a) Differentiate each of the following functions with respect to x .

(i) $(e^{-x} + x^2)^3$ [2]

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(ii) $e^{2x} \sin 3x$ [3]

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(iii) $\frac{\cos 2x}{x^2 + 1}$

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(b) A function is defined implicitly by

$$2x - 3x^2y^3 = 5.$$

Find $\frac{dy}{dx}$ in terms of x and y .

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[6]

$$2\sec^2\theta - 5 = \tan\theta.$$

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3. Given that θ is small, find an estimate for the solution of the equation $\frac{\cos \theta}{1 + \sin 2\theta} = 0.8$. [6]

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- (b) Hence, deduce an approximate value for $\int_0^{\frac{\pi}{3}} (\tan^2 x + 2) dx$. [2]

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(b) Determine the range of values of x where the curve is convex. [2]

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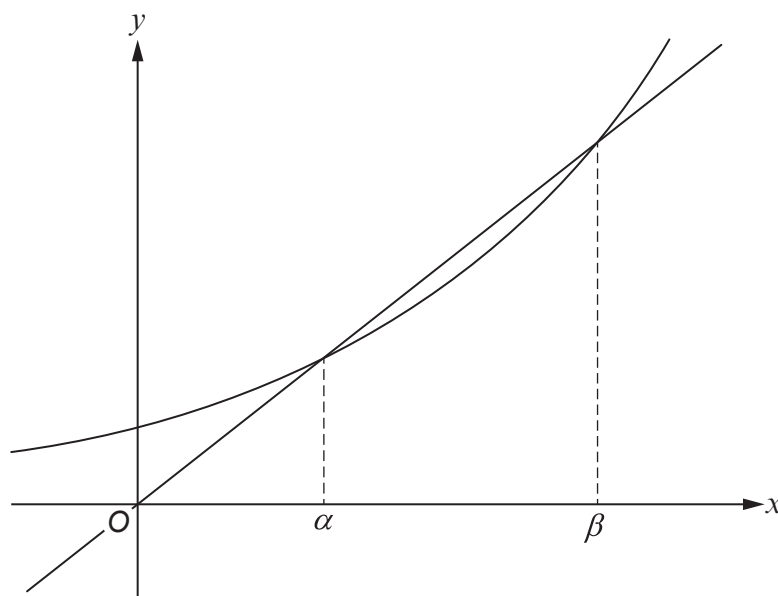


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6. The diagram below shows a sketch of the curve with equation $y = e^x$ and the straight line with equation $y = 3x$.



The straight line intersects the curve at the points where $x = \alpha$ and $x = \beta$. Approximate values for α and β are 0.62 and 1.5 respectively.

- (a) The iterative formula $x_{n+1} = \frac{1}{3}e^{x_n}$ is used to find a more accurate approximation for α . Taking $x_0 = 0.62$, use the iterative formula to obtain the values of x_1 , x_2 and x_3 . Give your answers correct to three decimal places. [2]

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7. The first and last terms of an arithmetic series are -3 and 61 respectively. The sum of all of the terms is 957 . Determine

(a) the number of terms,

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(b) the common difference,

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(c) the middle term.

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10. (a) Sketch the graph of $y = \sec x$ for $0 \leq x \leq \alpha$, where $0 < \alpha < \frac{\pi}{2}$.

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(b) Explain why $\int_0^{\alpha} \sec x \, dx > \alpha$.

[2]

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11. Find $\int_1^2 \frac{5x+2}{(x+1)^2(2x-1)} dx$, giving your answer in the form $\ln a + b$, where a, b are constants. [10]

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13. A curve is defined parametrically by

$$x = 2t^3 + 1, \quad y = 3t^2.$$

- (a) Show that the gradient of the curve at the point with parameter p is $\frac{1}{p}$. [4]

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- (b) Find the equation of the normal to the curve at the point with parameter t , where $t = 1$. [4]

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- (c) Determine the equation of the tangent to the curve at the point with parameter t , where $t = 0$. [3]



15. A function f is defined by $f(x) = \frac{9}{(x-3)^2}$, where $x > 3$.

(a) Determine the range of f .

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[illegible]

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