

Surname	Centre Number	Candidate Number
First name(s)		2



GCE A LEVEL

1305U40-1



S25-1305U40-1

FRIDAY, 6 JUNE 2025 – MORNING

FURTHER MATHEMATICS – A2 unit 4
FURTHER 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	5	
2	20	
3	7	
4	12	
5	6	
6	8	
7	12	
8	9	
9	11	
10	18	
11	12	
Total	120	

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

1. (a) Write down the Maclaurin series expansion for e^{x^2} as far as the term in x^6 . Simplify your answer. [2]

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- (b) Hence, find an approximate value for $\int_0^1 e^{x^2} dx$. Give your answer correct to three decimal places. [3]

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- $$(\cos \theta + i \sin \theta)^n = \cos n\theta + i \sin n\theta$$
- for positive integer values of n .

[7]





[6]

[illegible]

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- [6]

- [1]





(b) Hence, find $\int 2x^3 \sinh x^2 dx$.

[4]

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$$\mathbf{M} = \begin{pmatrix} 3 & 0 & 4 \\ 3 & 2 & -1 \\ 2 & 0 & 7 \end{pmatrix}.$$

[5]





$$\mathbf{A} = \begin{pmatrix} 1 & 4 & p \\ 3 & -1 & q \\ 2 & 5 & r \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} 1 & p \\ 6 & r \\ 0 & 2 \end{pmatrix}, \quad \mathbf{C} = \begin{pmatrix} 25 & -6 \\ -3 & 11 \\ 32 & -17 \end{pmatrix}.$$

[7]





- [6]



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$$\cos x \frac{dy}{dx} + y = \sin x,$$

[8]

[illegible]



$$(i) \quad y = \cos^{-1}(2x-1) \quad [3]$$

$$(i) \quad y = \cos^{-1}(2x-1) \quad [3]$$

$$(ii) \quad y = 3x \sinh 4x \quad [3]$$



- Give your answer in the form $y = mx + c$, with m, c correct to two decimal places. [6]

[illegible]

8. (a) By putting $t = \tan\left(\frac{\theta}{2}\right)$, show that the equation $4\cos\theta + 7\sin\theta = 4 - \tan\left(\frac{\theta}{2}\right)$ can be written as

$$t^3 - 8t^2 + 15t = 0.$$

[3]

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[6]

[illegible]

$$\frac{d^2y}{dx^2} + 16y = 3\sin x,$$

[11]



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10. (a) (i) Show that $\frac{2x^3 + x^2 + 12}{x^3 - 2x^2 - 3x + 6}$ can be written as $2 + \frac{5x^2 + 6x}{x^3 - 2x^2 - 3x + 6}$. [2]

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- (ii) Hence, find $\int \frac{2x^3 + x^2 + 12}{x^3 - 2x^2 - 3x + 6} dx$. [9]

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[illegible]



- (c) Calculate the mean value of $y = \tanh 2x$ between $x = 0$ and $x = 2$, giving your answer correct to two significant figures. [3]

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11. (a) Sketch the graph of the curve C with polar equation

$$r = \cos^2 \theta, \quad \text{where } 0 \leq \theta < 2\pi.$$

[2]

Initial line



- [10]

[illegible]

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