



Oxford Cambridge and RSA

Thursday 19 June 2025 – Afternoon

A Level Mathematics B (MEI)

H640/03 Pure Mathematics and Comprehension

Printed Answer Booklet

Time allowed: 2 hours



You must have:

- Question Paper H640/03 (inside this document)
- the Insert (inside this document)
- a scientific or graphical calculator



Please write clearly in black ink. **Do not write in the barcodes.**

Centre number

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Candidate number

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First name(s)

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Last name

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INSTRUCTIONS

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided in the **Printed Answer Booklet**. If you need extra space use the lined page at the end of the Printed Answer Booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
- Give your final answers to a degree of accuracy that is appropriate to the context.

INFORMATION

- This document has **20** pages.

ADVICE

- Read each question carefully before you start your answer.

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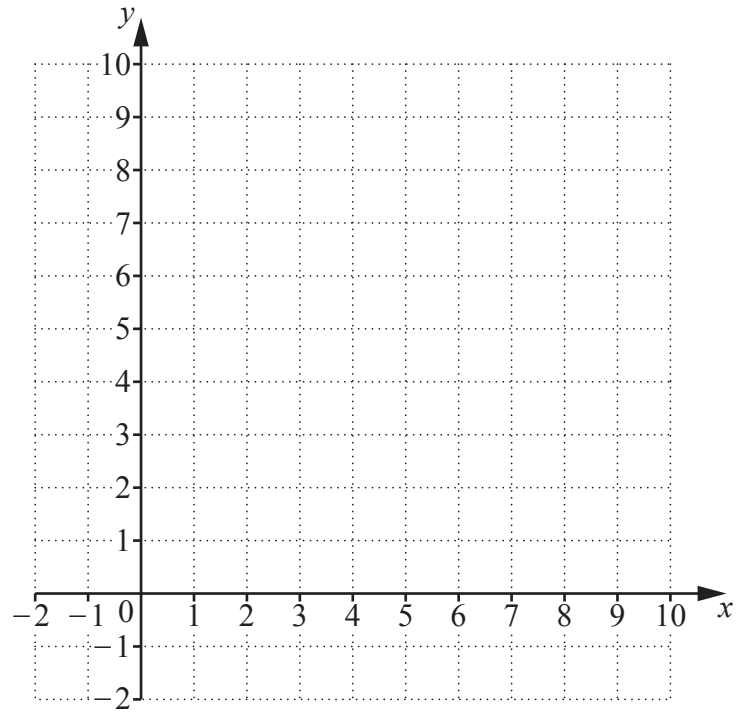
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1(a)

1(b)

2
$$\text{gf}(x) =$$

Domain of $gf(x)$:

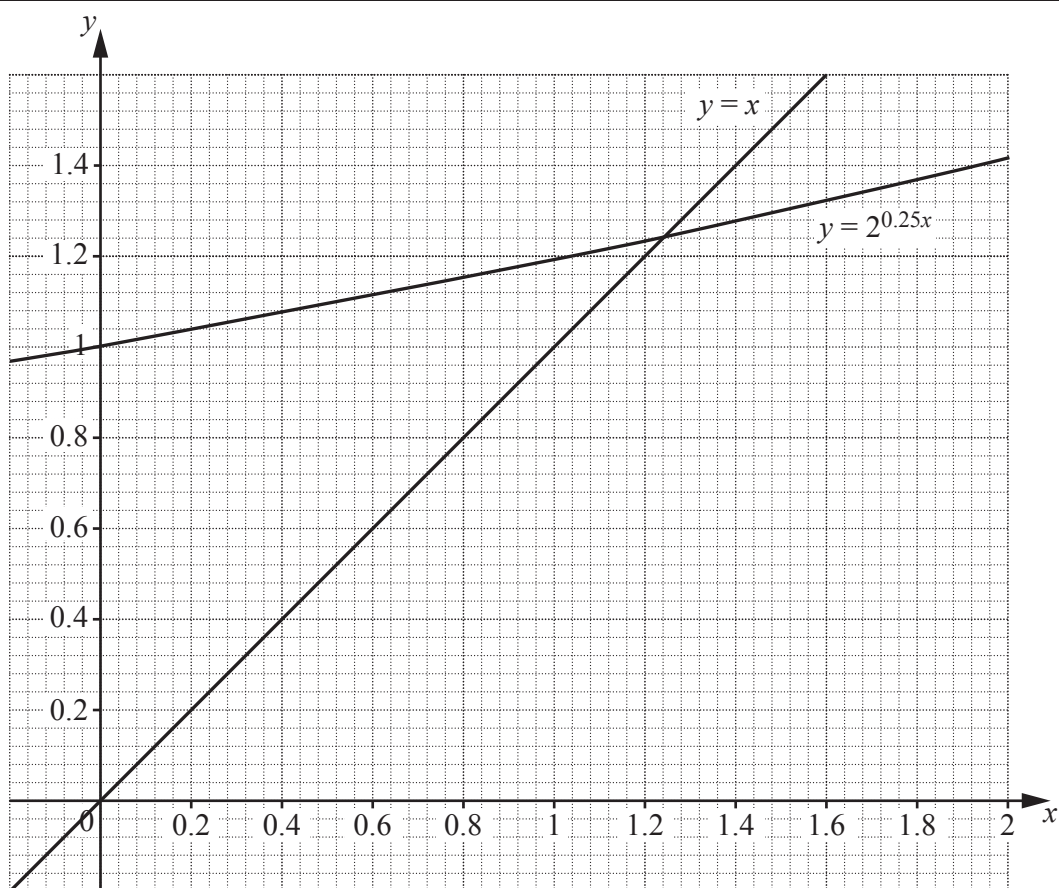
3(a)**3(b)**

3(c)

4

5(a)	
5(b)	
5(c)	

5(d)



5(e)

5(f)

6(a)	
6(b)	
7(a)	
7(b)	

7(c)(i)	
7(c)(ii)	
7(c)(iii)	

8(a)	
8(b)	
8(c)	
9(a)	
9(b)	
9(c)	

10

11(a)	
11(b)	

13
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Section B (15 marks)

The questions in this section refer to the article on the Insert. You should read the article before attempting the questions.

- 12 (a) Show that for the point on the curve where $x = 0$, $\frac{3a-x}{a+x} \geq 0$, as given in line 10. [1]
- (b) Use the equation of the curve given in line 8 to show that for all points on the curve where $x \neq 0$, $\frac{3a-x}{a+x} \geq 0$ as given in line 10. [1]
- (c) Show that it follows that $3a-x \geq 0$ and $a+x > 0$, as given in lines 10 and 11, for values of $a > 0$. [3]
- (d) Hence find, in terms of a where $a > 0$, the range of values of x for points on the curve $y^2 = \frac{x^2(3a-x)}{a+x}$. [1]
- (e) Find the equation of the asymptote to the curve. [1]

12(a)	
12(b)	

12(c)	
	12(d)
12(e)	

13 Use $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$, with suitable choices for A and B , to show that

$$\tan 3\theta = \frac{t(3-t^2)}{1-3t^2}, \text{ where } t = \tan \theta, \text{ as given in line 25.}$$

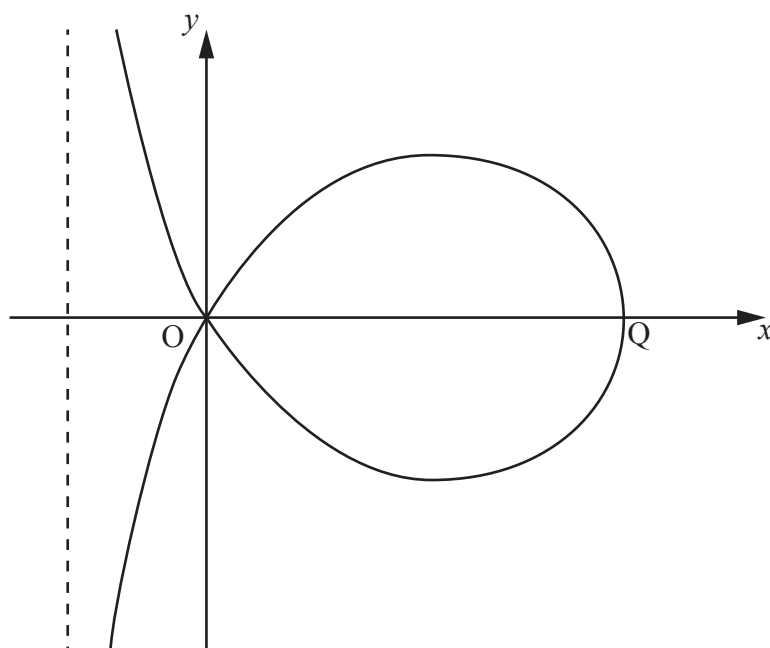
[3]**13**

17
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- 14 (a) Draw and label a suitable triangle on the diagram in the **Printed Answer Booklet** to show that $\tan \theta = \frac{y}{x}$, as given in line 30. [1]
- (b) Subtract $x = \frac{a(3-t^2)}{1+t^2}$ from $3a$ to show that $3a-x = \frac{4at^2}{1+t^2}$. [1]
- (c) Find an expression, in terms of a and t , for $a+x$. [1]
- (d) Hence, or otherwise, show that the parametric equations given in lines 29 and 31 are equivalent to $y^2 = \frac{x^2(3a-x)}{a+x}$, as claimed in lines 8 and 33. [2]

14(a)



14(b)

14(c)	
14(d)	

[illegible]

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