



Oxford Cambridge and RSA

Monday 19 October 2020 – 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)

Last name

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 pages 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 **16** pages.

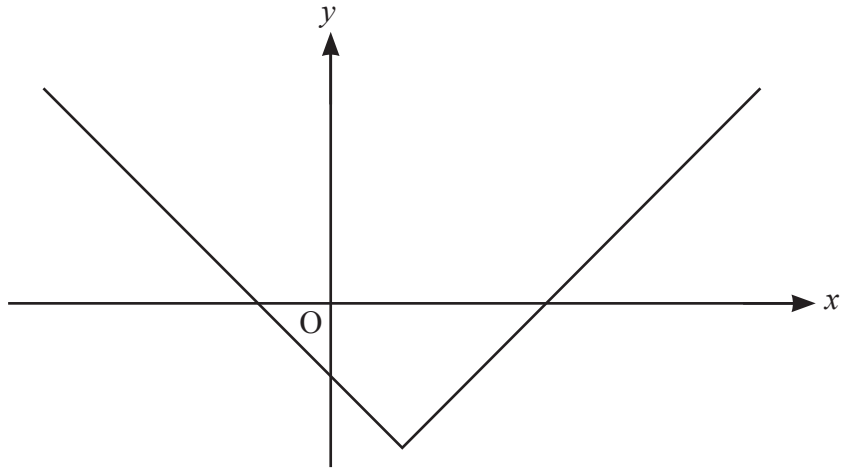
ADVICE

- Read each question carefully before you start your answer.

Section A (60 marks)

1

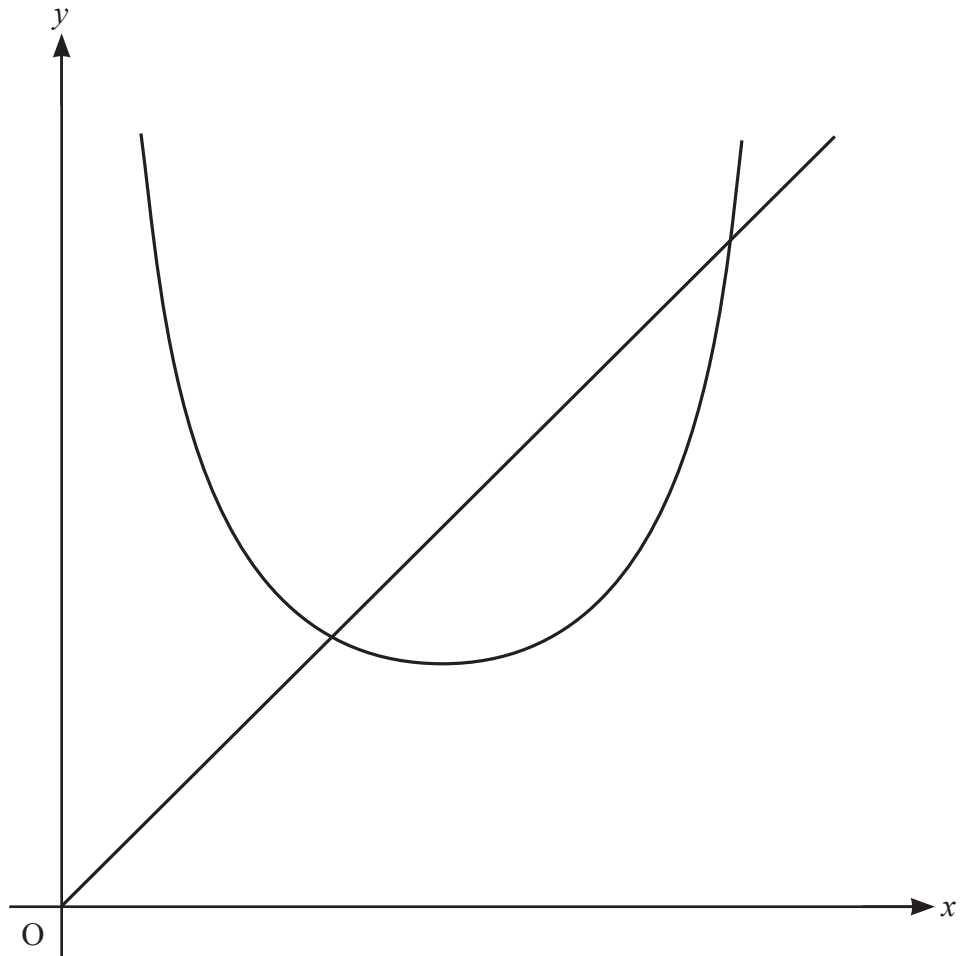
2



5(a)(i)	
5(a)(ii)	
5(b)	
5(c)(i)	
5(c)(ii)	

5(d)

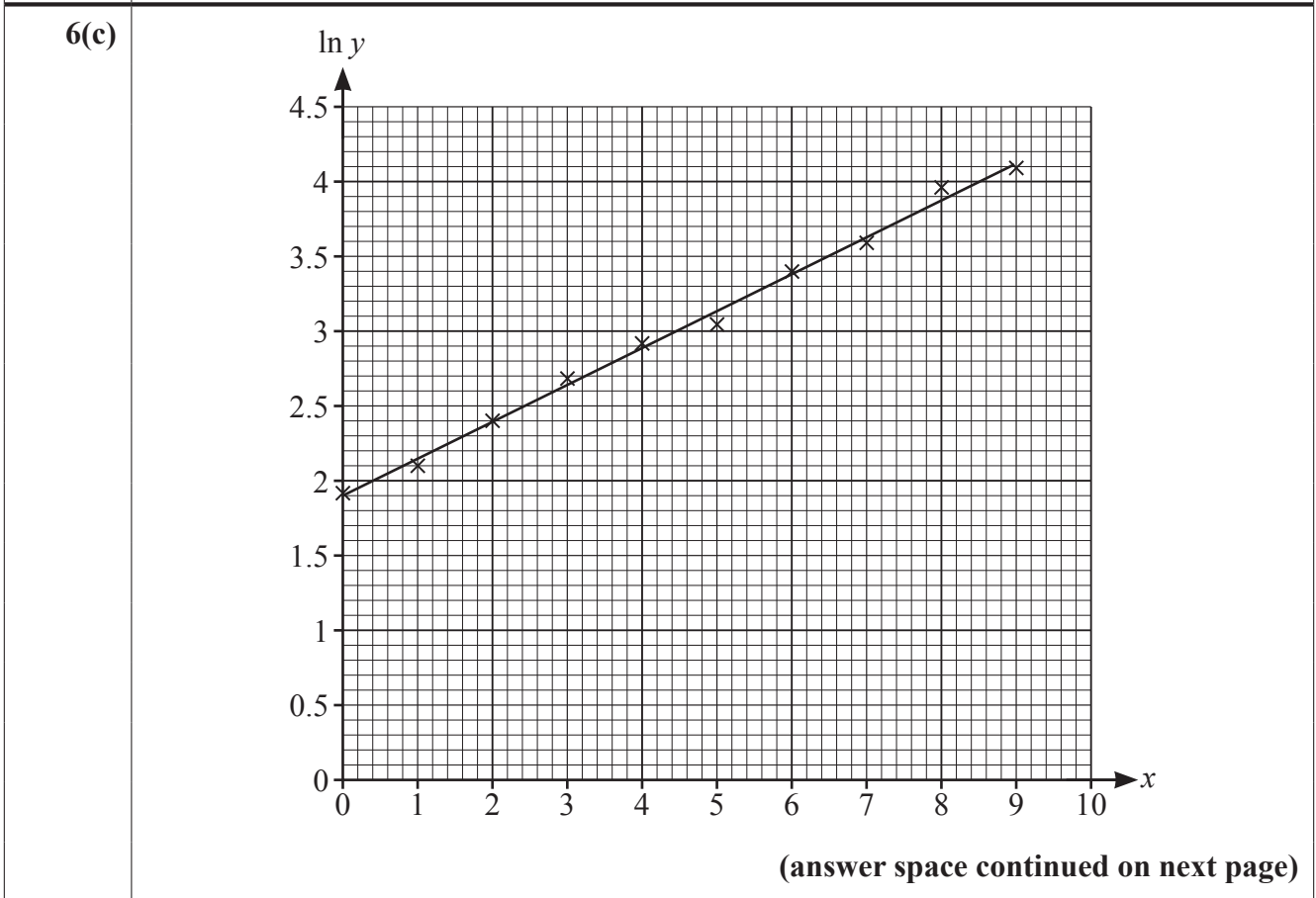
5(e)



6(a)(i)	
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6(a)(ii)	
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6(b)	
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6(c) (continued)	
6(d)	
6(e)	

8(a)(i)	

8(a)(ii)	

8(b)	

(answer space continued on next page)

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.

9 (a) Show that if $a = 1$ and $b > 1$ then $a^b < b^a$. [2]

(b) Find integer values of a and b with $b > a > 1$ and a^b not greater than b^a (a counter example to the conjecture given in lines 7–8). [1]

9(a)	
9(b)	

10 In this question you must show detailed reasoning.

Show that $\int_e^\pi \frac{1}{x} dx = \ln \pi - 1$ as given in line 37. [2]

10	

11 Show that e^x is an increasing function for all values of x , as stated in line 39. [2]

11	

12 (a) Show that the only stationary point on the curve $y = \frac{\ln x}{x}$ occurs where $x = e$, as given in line 45. [3]

(b) Show that the stationary point is a maximum. [3]

(c) It follows from part **(b)** that, for any positive number a with $a \neq e$,

$$\frac{\ln e}{e} > \frac{\ln a}{a}.$$

Use this fact to show that $e^a > a^e$. [2]

12(a)	
12(b)	
12(c)	

