



Oxford Cambridge and RSA

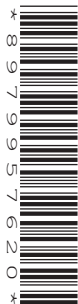
Monday 18 October 2021 – Afternoon

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 **20** pages.

ADVICE

- Read each question carefully before you start your answer.

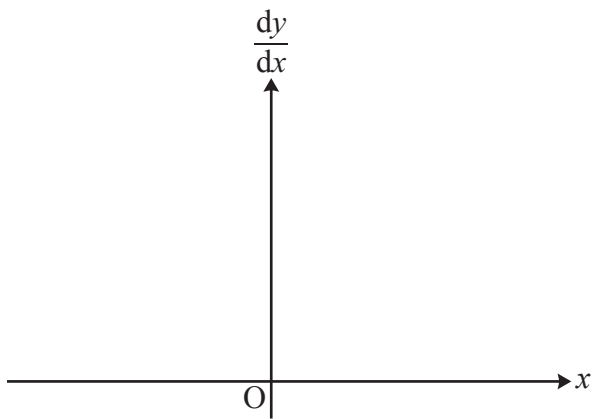
Section A (60 marks)

1(a)	
1(b)	
1(c)	
2	
3(a)	
(answer space continued on next page)	

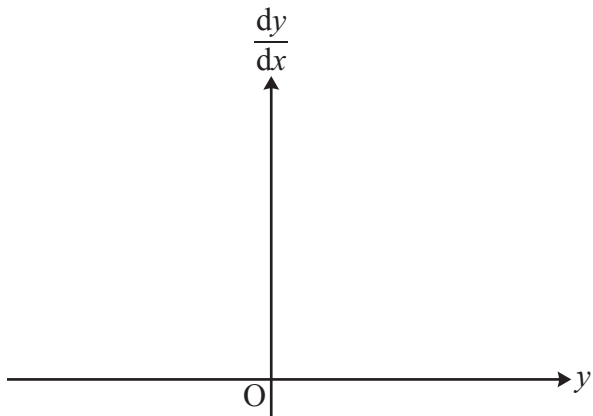
4(a)

4(b)

5(a)(i)

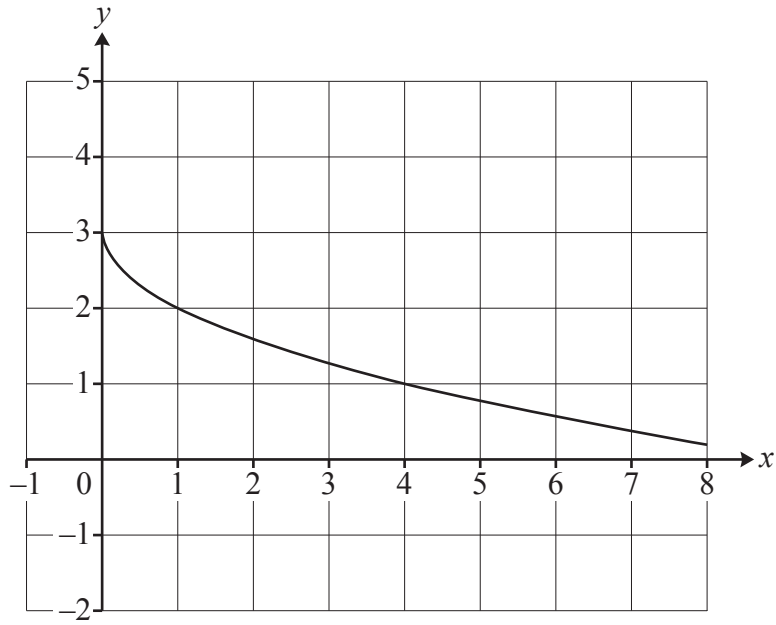


5(a)(ii)



5(b)(i)	
5(b)(ii)	
	$A =$
$k =$	
5(b)(iii)	

9(a)



9(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.

- 12 Show that $\beta = \arctan\left(\frac{1}{3}\right)$, as given in line 15. [3]

12	

- 13 (a) Use triangle ABE in Fig. C2 to show that $\arctan x + \arctan\left(\frac{1}{x}\right) = \frac{\pi}{2}$, as given in line 29. [1]
- (b) Sketch the graph of $y = \arctan x$. [1]
- (c) What property of the arctan function ensures that $y > \frac{1}{x} \Rightarrow \arctan y > \arctan\left(\frac{1}{x}\right)$, as given in line 30? [1]

13(a)	

14 (a) Show that

$$\arctan\left(\frac{1}{n+1}\right) + \arctan\left(\frac{1}{n^2+n+1}\right) = \arctan\left(\frac{1}{n}\right) \Rightarrow \arctan\left(\frac{1}{2}\right) + \arctan\left(\frac{1}{3}\right) = \arctan 1. \quad [1]$$

(b) Use the arctan addition formula in line 23 to show that

$$\arctan\left(\frac{1}{n+1}\right) + \arctan\left(\frac{1}{n^2+n+1}\right) = \arctan\left(\frac{1}{n}\right), \text{ as given in line 39.} \quad [4]$$

14(a)	
14(b)	
	(answer space continued on next page)

15 Prove that $\arctan 1 + \arctan 2 + \arctan 3 = \pi$, as given in line 41.

[4]

15

