

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Monday 18 October 2021 – Afternoon

A Level Mathematics B (MEI)

H640/03 Pure Mathematics and Comprehension

Printed Answer Booklet

**Time allowed: 2 hours
plus your additional time allowance**

YOU MUST HAVE:

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

Please write clearly in black ink.

Centre number

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Candidate number

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First name(s) _____

Last name _____

READ INSTRUCTIONS OVERLEAF



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.

ADVICE

Read each question carefully before you start your answer.

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SECTION A (60 marks)

1 (a) _____

1 (b) _____

1 (c) _____

2

3 (a)

(answer space continued on next page)

3 (a) (continued) _____

3 (b) _____

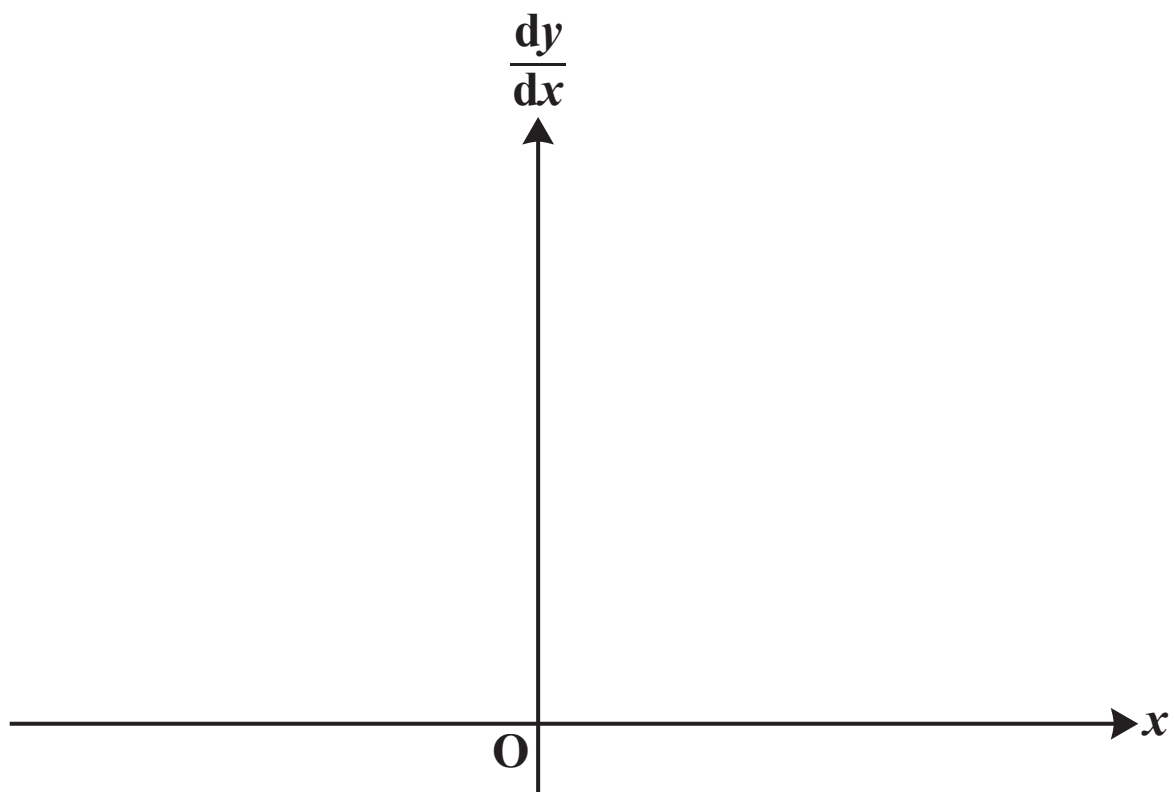
(answer space continued on next page)

3 (b) (continued) _____

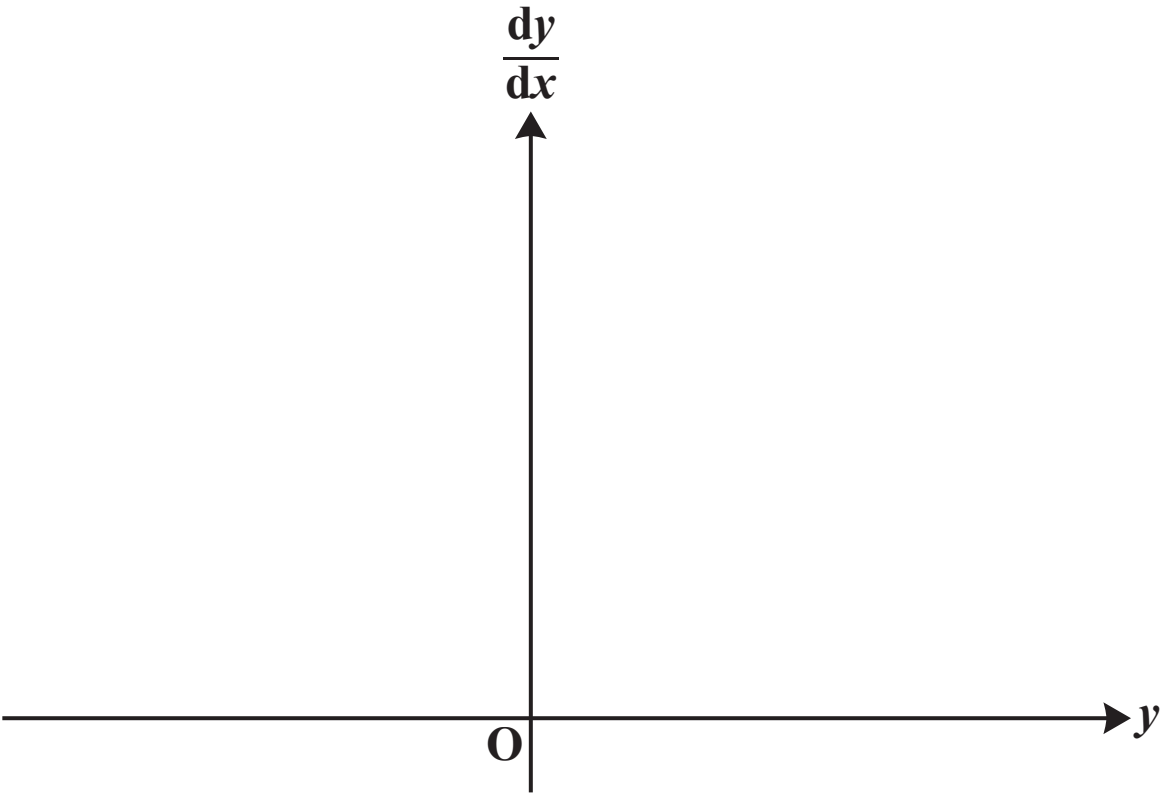
4 (a) _____

4 (b)

5 (a) (i)



5 (a) (ii)



5 (b) (i)

5 (b) (ii)

$A =$ _____

$k =$ _____

5 (b)(iii)

(answer space continued on next page)

5 (b)(iii) (continued) _____

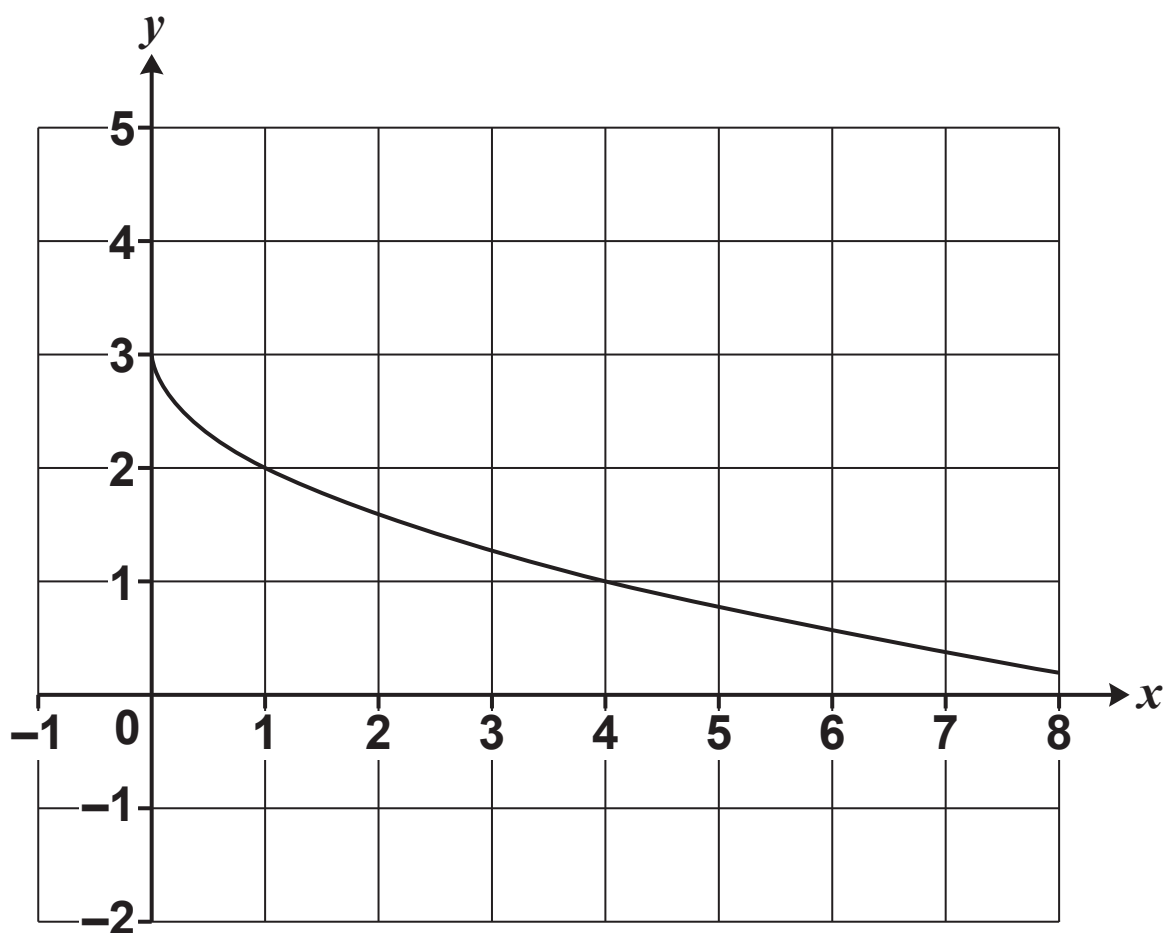
6 _____

7

[illegible]

[illegible]

9 (a)



9 (b)

(answer space continued on next page)

9 (b) (continued)

9 (b) (continued) _____

10 (a) _____

(answer space continued on next page)

10 (a) (continued) _____

10 (b) _____

(answer space continued on next page)

10 (b) (continued) _____

10 (b) (continued) _____

$A =$ _____

$B =$ _____

[illegible]

22

11 (continued) _____

11 (continued) _____

11 (continued) _____

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 18. [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 40. [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 41? [1]

13 (a) _____

13 (b)

13 (c)

(answer space continued on next page)

13 (c) (continued) _____

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 30 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 58. [4]

14 (a) _____

(answer space continued on next page)

14 (a) (continued) _____

14 (b) _____

14 (b) (continued) _____

(answer space continued on next page)

14 (b) (continued) _____

15 Prove that $\arctan 1 + \arctan 2 + \arctan 3 = \pi$, as given in line 61. [4]

15

[illegible]

(answer space continued on next page)

15 (continued) _____

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

[illegible]

[illegible]



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