

**Modified Enlarged 24pt**  
**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)** \_\_\_\_\_

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**1 (b)** \_\_\_\_\_

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1 (c) \_\_\_\_\_

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**3 (a)** \_\_\_\_\_  
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**3 (a) (continued)** \_\_\_\_\_

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**3 (b)** \_\_\_\_\_

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**3 (b) (continued)** \_\_\_\_\_

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**4 (a)** \_\_\_\_\_

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**4 (a) (continued)** \_\_\_\_\_

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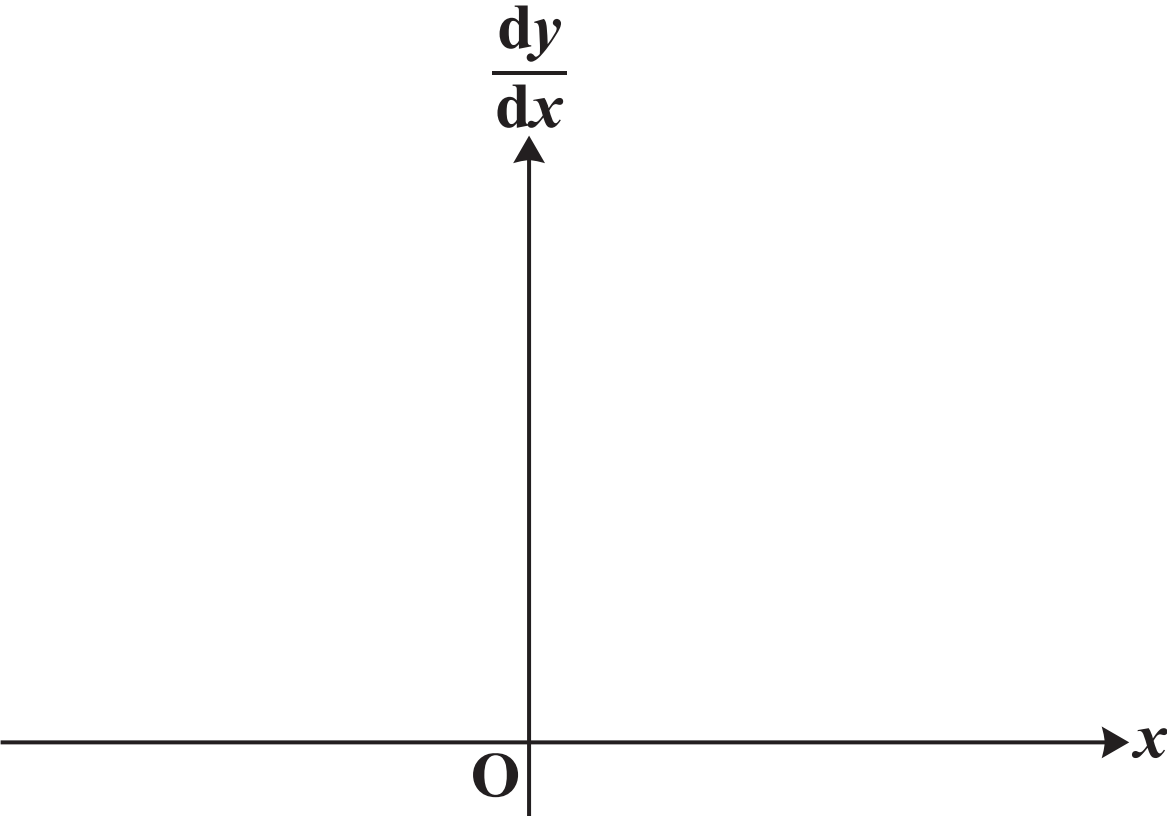
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**4 (b)** \_\_\_\_\_

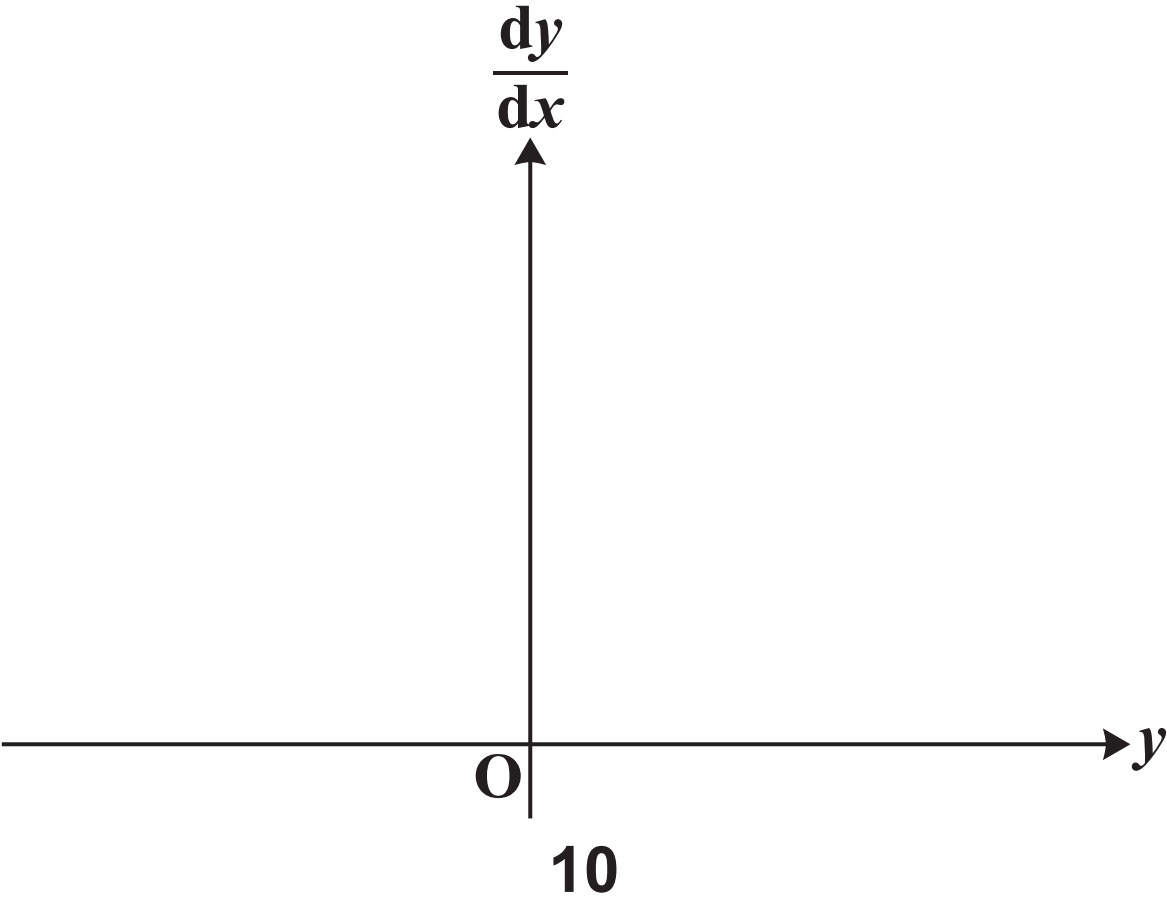
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5 (a) (i)



5 (a) (ii)



**5 (b) (i)** \_\_\_\_\_

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**5 (b) (ii)** \_\_\_\_\_

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**5 (b) (ii) (continued)** \_\_\_\_\_

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$A =$  \_\_\_\_\_

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**5 (b)(iii)** \_\_\_\_\_

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**5    (b)(iii) (continued)** \_\_\_\_\_

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**6** \_\_\_\_\_

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14

6 (continued) \_\_\_\_\_

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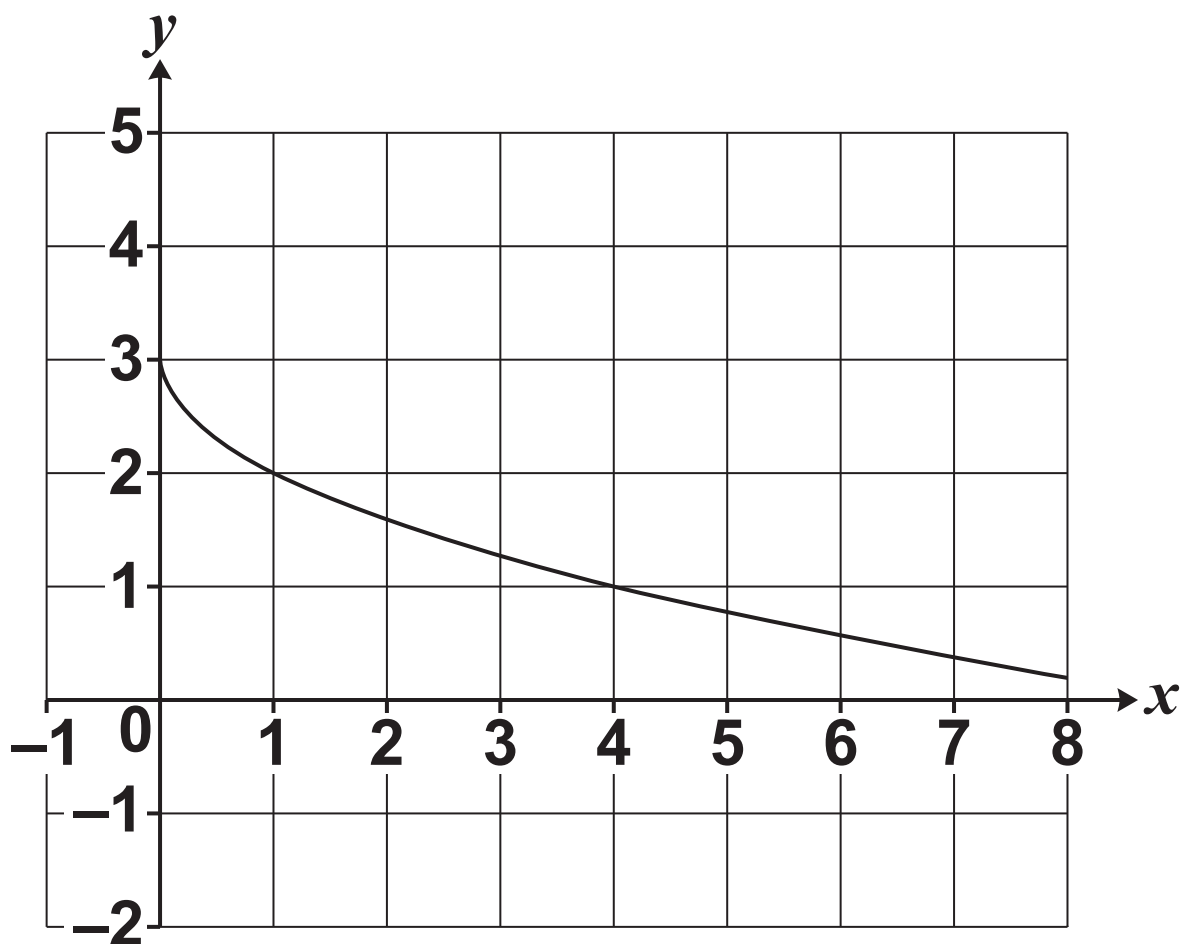
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[illegible]



[illegible]

9 (a)



9 (b) \_\_\_\_\_

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[illegible]

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[illegible]

21

9 (b) (continued) \_\_\_\_\_

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10 (a) \_\_\_\_\_

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10 (a) (continued) \_\_\_\_\_

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10 (b) \_\_\_\_\_

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[illegible]

24



[illegible]

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10 (b) (continued) \_\_\_\_\_

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$A =$  \_\_\_\_\_

$B =$  \_\_\_\_\_

[illegible]

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[illegible]

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[illegible]

**(answer space continued on next page)**

[illegible]

30

11 (continued) \_\_\_\_\_

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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 Show that  $\beta = \arctan\left(\frac{1}{3}\right)$ , as given in line 24. [3]**

**12** \_\_\_\_\_

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**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 51. [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 52? [1]**

**13 (a)** \_\_\_\_\_  
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**13 (a) (continued)** \_\_\_\_\_

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**13 (b)**

13 (c) \_\_\_\_\_

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**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 lines 37–38 to show that**

$$\arctan\left(\frac{1}{n+1}\right) + \arctan\left(\frac{1}{n^2+n+1}\right) =$$
$$\arctan\left(\frac{1}{n}\right), \text{ as given in lines 73–74. } [4]$$

**14 (a)** \_\_\_\_\_

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**14 (a) (continued)** \_\_\_\_\_

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**14 (b)** \_\_\_\_\_

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**14 (b) (continued)** \_\_\_\_\_

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**15 Prove that**  
 **$\arctan 1 + \arctan 2 + \arctan 3 = \pi$ , as**  
**given in line 77. [4]**

**15** \_\_\_\_\_  
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**40**



[illegible]

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15 (continued) \_\_\_\_\_

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**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]






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