

# 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					Candidate number			
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.

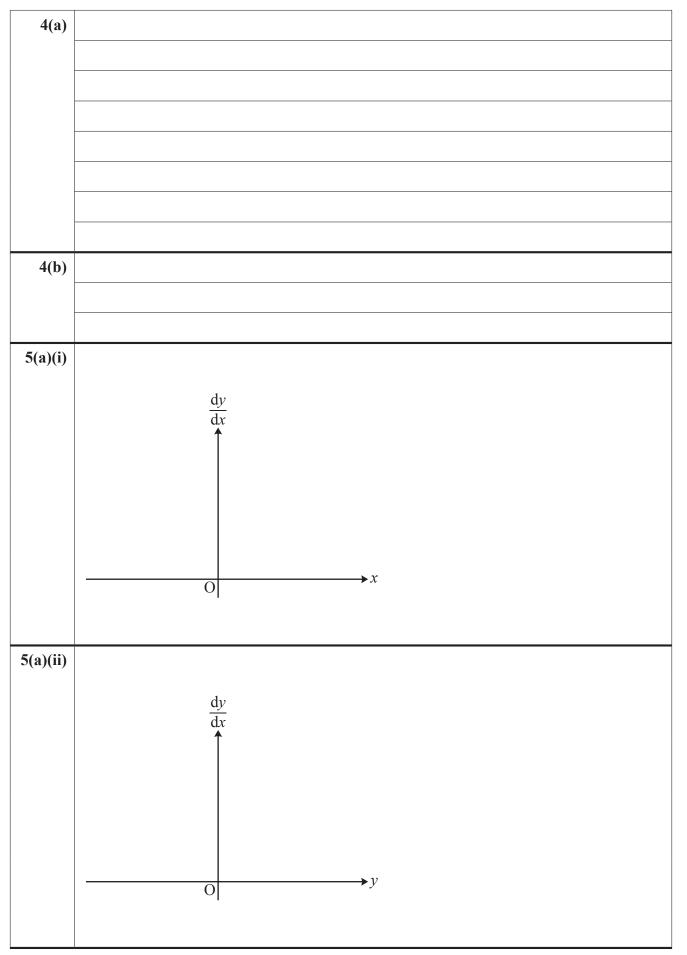
#### ADVICE

• Read each question carefully before you start your answer.

Section A (60 marks)

1(a)	
1(b)	
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1(c)	
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<b>3</b> (a)	
C (11)	
	(answer space continued on next page)

<b>3</b> (a)	(continued)
3(b)	



5(b)(i)	
5(b)(ii)	
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	<i>k</i> =
5(b)(iii)	

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9(a)	
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	-1  0  1  2  3  4  3  0  7  8
9(b)	
	(answer space continued on next page)

<b>(b)</b>	(continued)

10(a) 10(b) (answer space continued on next page)

10(b)	(continued)
	<i>A</i> =
	B =

11 (answer space continued on next page)

11	(continued)

[3]

[1]

#### 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  $\beta = \arctan(\frac{1}{3})$ , as given in line 15.

10	
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  $y = \arctan x$ .
  - (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)	

13(b)	
13(c)	
15(0)	

14 (a) Show that

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

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

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

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14(a)	
14(b)	
14(0)	
	(answer space continued on next page)

14(b)	(continued)


15 Prov

#### **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).



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