

Thursday 20 June 2024 - 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 clea	arly in	black	ink.	Do no	ot writ	te in the barcodes.		
Centre number						Candidate number		
First name(s)								
Last name								

48 330048

48 330048

48 330048

INSTRUCTIONS

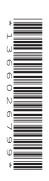
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided in the Printed Answer Booklet. If you need extra space use the lined pages at the end of the Printed Answer Booklet. The guestion numbers must be clearly shown.
- Answer 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(a)	
	$f^{-1}(x) =$
	Domain of inverse function:
2(b)	

3	
4	
4	
4	
4	
4	
4	
4	
4	
4	
4	
4	
4	
4	
4	
4	
4	
4	

5	

6	
_	
7	

8(a)	
8(b)	

9(a)	
9(b)	
9(c)	
9(d)(i)	
)(u)(i)	
9(d)(ii)	

10	
	<i>y</i>
	-4 -3 -2 -1 0 1 2 3 4 x
11(a)	

11(b)	
11(c)	

12(a)	
	(answer space continued on next page)

12(a)	(continued)
12(b)	

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.

		ordinate of the point of intersection of the tangents at the points A and B in Fig. C1 . [1
	13	
14	corre	titute appropriate values of t_1 and t_2 to verify that the expression $t_1^2 + t_2^2 + t_1 t_2 + \frac{1}{2}$ gives the ct value for the y-coordinate of the point of intersection of the normals at the points A and E g. C2.
	14	
	14	
	14	
	14	
	14	
	14	
	14	

		13	
15	(a)	Show that, for the curve $y = ax^2 + bx + c$, the equation of the tangent at the point with x -coordinate t is $y = (2at + b)x - at^2 + c$.	[3]
	(b)	Hence show that for the curve with equation $y = ax^2 + bx + c$, the tangents at two points, and Q, on the curve cross at a point which has x-coordinate equal to the mean of the x-coordinates of points P and Q, as given in lines 11 to 14.	P [3]
	15(a)		

15(b)

16	Show that the expression $a\left(\frac{x_{\rm p}+x_{\rm Q}}{2}\right)^2 + b\left(\frac{x_{\rm p}+x_{\rm Q}}{2}\right) + c - a\left(\frac{x_{\rm p}-x_{\rm Q}}{2}\right)^2$ is equivalent to	
	$ax_p x_Q + b\left(\frac{x_p + x_Q}{2}\right) + c$, as given in lines 15 and 16.	[2]

16	

17 Show that, for the curve $y = x^2$, the equation of the normal at the point (t, t^2) is $y = -\frac{x}{2t} + t^2 + \frac{1}{2}$, as given in line 27. [3]

17	
17	

18 A student is investigating the intersection points of tangents to the curve $y = 6x^2 - 7x + 1$. She uses software to draw tangents at pairs of points with x-coordinates differing by 5.

Find the equation of the curve that all the intersection points lie on. [2]

18	

DO NOT WRITE IN THIS SPACE

16

EXTRA ANSWER SPACE

If you need extra space use this lined page. You must write the question numbers clearly in the margin.



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series. If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possiopportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

 ${\tt OCR}\ is\ part\ of\ Cambridge\ University\ Press\ \&\ Assessment,\ which\ is\ itself\ a\ department\ of\ the\ University\ of\ Cambridge.$