OCR
Oxford Cambridge and RSA

# Tuesday 21 June 2022 – 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)

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| **1** | |
| **2(a)** | |
| **2(b)(i)** | |
| **2(b)(ii)** | |

**3(a)**

**3(b)**

**4**

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| **5(a)** | |
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**5(b)**

**6(a)**

**6(b)**

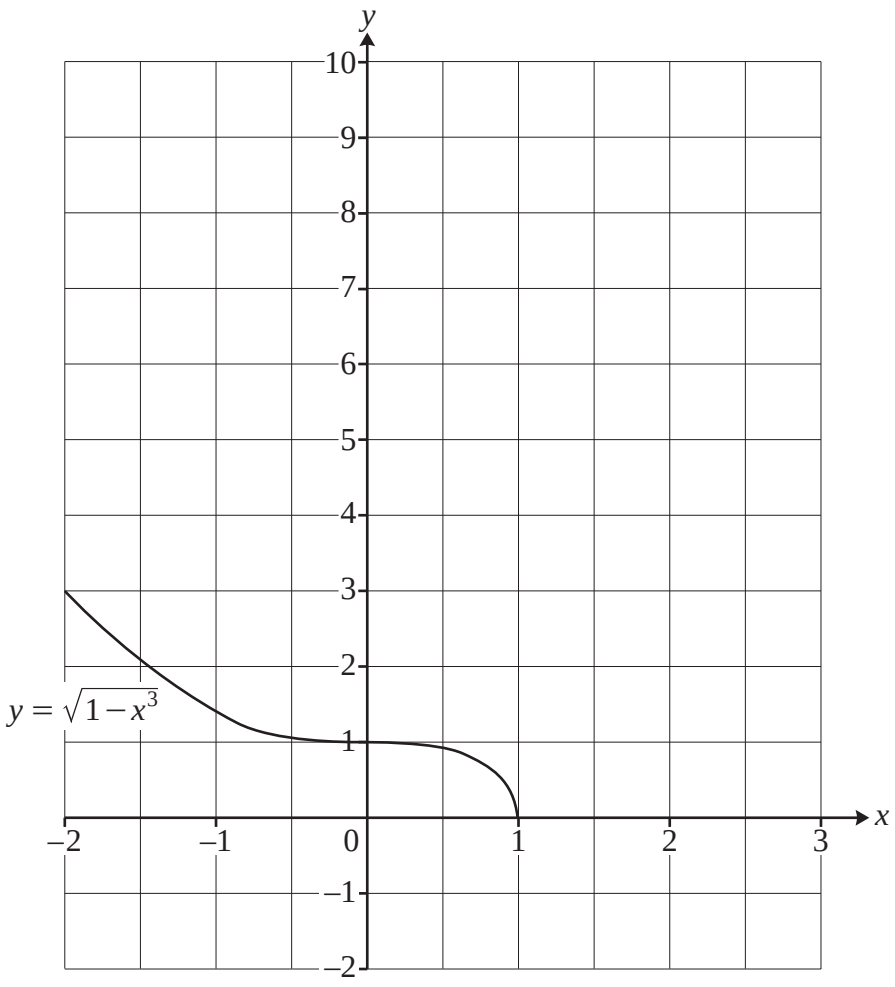
**7(a)**

**7(b)**

**7(c)**

**7(d)**

**7(e)**




**7(f)**

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**7(f)** **(continued)**

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| **8(a)** | |
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| **8(b)** | |
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| | Coordinates of D: |

**8(c)**

**8(d)**

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| **8(d)** | **(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.**

**9** Show that $y = x$ has the same gradient as $y = \sin x$ when $x = 0$, as stated in line 5. **[2]**

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| **9** | |
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**10 In this question you must show detailed reasoning.**

**Fig. C2.2** indicates that the curve $y = \dfrac{4x(\pi - x)}{\pi^2} - \sin x$ has a stationary point near $x = 3$.

- Verify that the $x$-coordinate of this stationary point is between 2.6 and 2.7.
- Show that this stationary point is a maximum turning point. **[5]**

**10**

**11** Show that, for the angle 45°, the formula $\sin\theta \approx \dfrac{4\theta(180-\theta)}{40\,500-\theta(180-\theta)}$ given in line 28 gives the same approximation for the sine of the angle as the formula $\sin x \approx \dfrac{16x(\pi-x)}{5\pi^2-4x(\pi-x)}$ given in line 23. **[3]**

**11**

**12** **(a)** Show that $\cos x = \sin\left(x + \frac{\pi}{2}\right)$. **[2]**

**(b)** Hence show that $\sin x \approx \frac{16x(\pi - x)}{5\pi^2 - 4x(\pi - x)}$ gives the approximation $\cos x \approx \frac{\pi^2 - 4x^2}{\pi^2 + x^2}$, as stated in line 31. **[3]**

**12(a)**

**12(b)**

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| 12(b) | (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).