

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel
Level 3 GCE

Centre Number

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Candidate Number

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Thursday 08 October 2020

Afternoon (Time: 1 hour 30 minutes)

Paper Reference **9FM0/02**

Further Mathematics

Advanced

Paper 2: Core Pure Mathematics 2

You must have:

Mathematical Formulae and Statistical Tables (Green), calculator

Total Marks

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Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for algebraic manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 7 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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1. The curve C has equation

$$y = 31 \sinh x - 2 \sinh 2x \quad x \in \mathbb{R}$$

Determine, in terms of natural logarithms, the exact x coordinates of the stationary points of C .

(7)

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7.

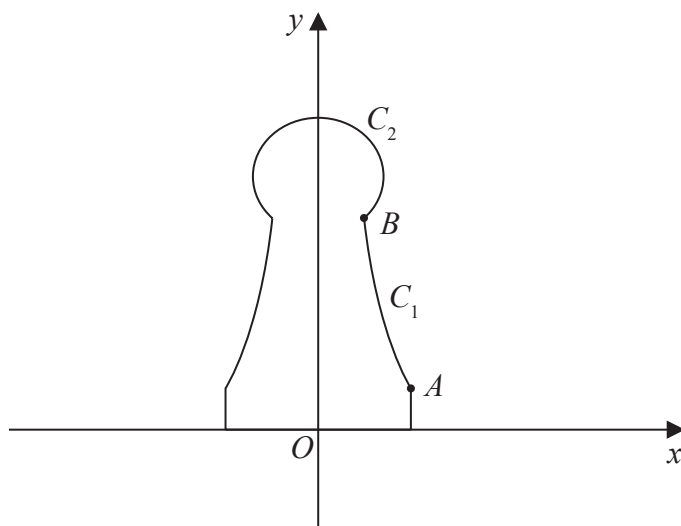


Figure 1

A student wants to make plastic chess pieces using a 3D printer. Figure 1 shows the central vertical cross-section of the student's design for one chess piece. The plastic chess piece is formed by rotating the region bounded by the y -axis, the x -axis, the line with equation $x = 1$, the curve C_1 and the curve C_2 through 360° about the y -axis.

The point A has coordinates $(1, 0.5)$ and the point B has coordinates $(0.5, 2.5)$ where the units are centimetres.

The curve C_1 is modelled by the equation

$$x = \frac{a}{y + b} \quad 0.5 \leq y \leq 2.5$$

(a) Determine the value of a and the value of b according to the model.

(2)

The curve C_2 is modelled to be an arc of the circle with centre $(0, 3)$.

(b) Use calculus to determine the volume of plastic required to make the chess piece according to the model.

(9)



