

CANDIDATE
NAME

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CENTRE
NUMBER

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NUMBER

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MATHEMATICS

9709/11

Paper 1 Pure Mathematics 1 (P1)

October/November 2017

1 hour 45 minutes

Candidates answer on the Question Paper.

Additional Materials: List of Formulae (MF9)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.

Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

The use of an electronic calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 75.

This document consists of **19** printed pages and **1** blank page.



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(iii) Find the maximum volume of a cone that can be made by these machines. [1]

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(b) (i) Show that the equation

$$(\sin \theta + 2 \cos \theta)(1 + \sin \theta - \cos \theta) = \sin \theta(1 + \cos \theta)$$

may be expressed as $3 \cos^2 \theta - 2 \cos \theta - 1 = 0$. [3]

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(ii) Hence solve the equation

$$(\sin \theta + 2 \cos \theta)(1 + \sin \theta - \cos \theta) = \sin \theta(1 + \cos \theta)$$

for $-180^\circ \leq \theta \leq 180^\circ$. [4]

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9 Functions f and g are defined for $x > 3$ by

$$f : x \mapsto \frac{1}{x^2 - 9},$$
$$g : x \mapsto 2x - 3.$$

(i) Find and simplify an expression for $gg(x)$. [2]

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(ii) Find an expression for $f^{-1}(x)$ and state the domain of f^{-1} . [4]

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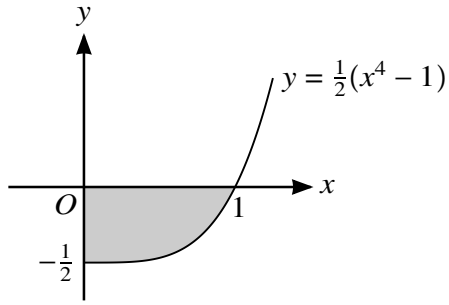
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The diagram shows part of the curve $y = \frac{1}{2}(x^4 - 1)$, defined for $x \geq 0$.

- (i) Find, showing all necessary working, the area of the shaded region. [3]

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- (ii) Find, showing all necessary working, the volume obtained when the shaded region is rotated through 360° about the x -axis. [4]

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(iii) Find, showing all necessary working, the volume obtained when the shaded region is rotated through 360° about the y-axis. [5]

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