

Write your name here

Surname

Other names

**Pearson Edexcel**  
**International**  
**Advanced Level**

Centre Number

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Candidate Number

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# Core Mathematics C34

## Advanced

Tuesday 19 January 2016 – Morning  
**Time: 2 hours 30 minutes**

Paper Reference  
**WMA02/01**

**You must have:**

Mathematical Formulae and Statistical Tables (Blue)

Total Marks

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**Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra 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). Coloured pencils and highlighter pens must not be used.
- **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.
- When a calculator is used, the answer should be given to an appropriate degree of accuracy.

### Information

- The total mark for this paper is 125.
- 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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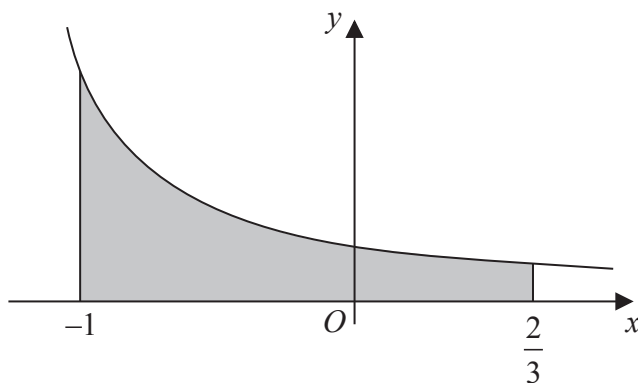


Figure 1

The curve  $C$  with equation  $y = \frac{2}{(4 + 3x)}$ ,  $x > -\frac{4}{3}$  is shown in Figure 1

The region bounded by the curve, the  $x$ -axis and the lines  $x = -1$  and  $x = \frac{2}{3}$ , is shown shaded in Figure 1

This region is rotated through 360 degrees about the  $x$ -axis.

(a) Use calculus to find the exact value of the volume of the solid generated.

(5)

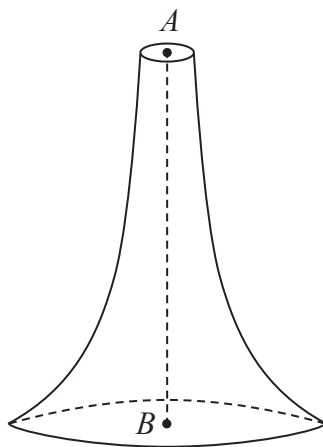


Figure 2

Figure 2 shows a candle with axis of symmetry  $AB$  where  $AB = 15$  cm.  $A$  is a point at the centre of the top surface of the candle and  $B$  is a point at the centre of the base of the candle. The candle is geometrically similar to the solid generated in part (a).

(b) Find the volume of this candle.

(2)

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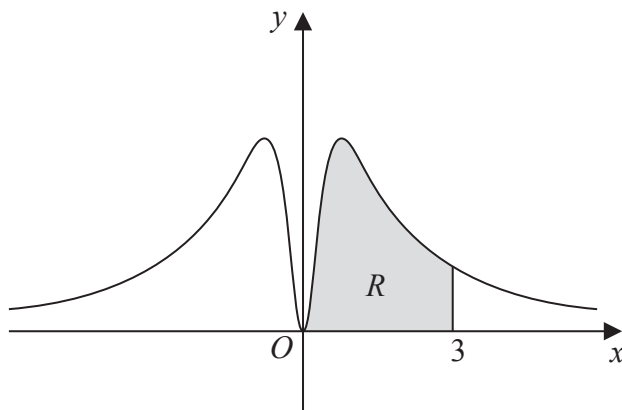


Figure 3

Figure 3 shows part of the curve  $C$  with equation

$$y = \frac{3\ln(x^2 + 1)}{(x^2 + 1)}, \quad x \in \mathbb{R}$$

- (a) Find  $\frac{dy}{dx}$  (2)
- (b) Using your answer to (a), find the exact coordinates of the stationary point on the curve  $C$  for which  $x > 0$ . Write each coordinate in its simplest form. (5)

The finite region  $R$ , shown shaded in Figure 3, is bounded by the curve  $C$ , the  $x$ -axis and the line  $x = 3$

- (c) Complete the table below with the value of  $y$  corresponding to  $x = 1$

$x$	0	1	2	3
$y$	0		$\frac{3}{5} \ln 5$	$\frac{3}{10} \ln 10$

(1)

- (d) Use the trapezium rule with all the  $y$  values in the completed table to find an approximate value for the area of  $R$ , giving your answer to 4 significant figures. (3)

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11.

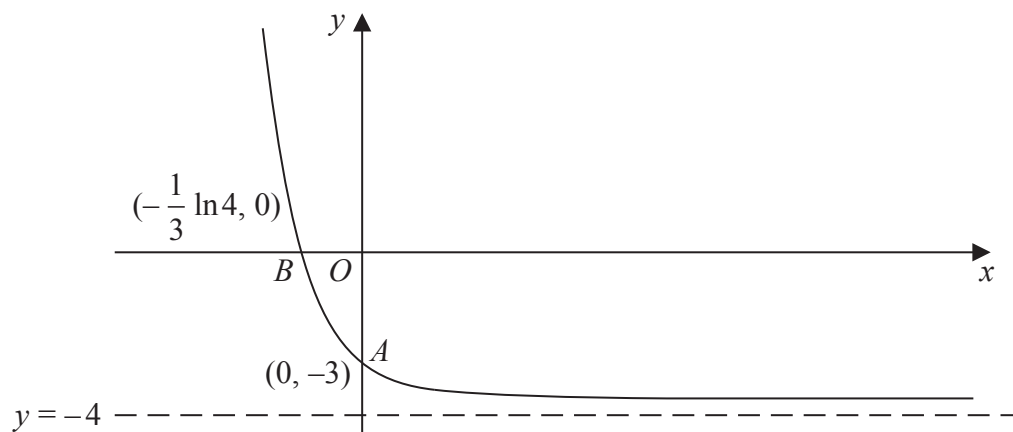


Figure 4

Figure 4 shows a sketch of part of the curve with equation  $y = f(x)$ ,  $x \in \mathbb{R}$

The curve meets the coordinate axes at the points  $A(0, -3)$  and  $B(-\frac{1}{3} \ln 4, 0)$  and the curve has an asymptote with equation  $y = -4$

In separate diagrams, sketch the graph with equation

(a)  $y = |f(x)|$  (4)

(b)  $y = 2f(x) + 6$  (3)

On each sketch, give the exact coordinates of the points where the curve crosses or meets the coordinate axes and the equation of any asymptote.

Given that

$$f(x) = e^{-3x} - 4, \quad x \in \mathbb{R}$$

$$g(x) = \ln\left(\frac{1}{x+2}\right), \quad x > -2$$

(c) state the range of  $f$ , (1)

(d) find  $f^{-1}(x)$ , (3)

(e) express  $fg(x)$  as a polynomial in  $x$ . (3)

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**Question 11 continued**

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