

Numerical Methods

Question Paper 4

Level	A Level
Subject	Mathematics (Pure)
Exam Board	AQA
Module	Core 3
Topic	Trigonometry
Sub Topic	Numerical methods
Booklet	Question Paper 4

Time Allowed: 41 minutes

Score: /34

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1

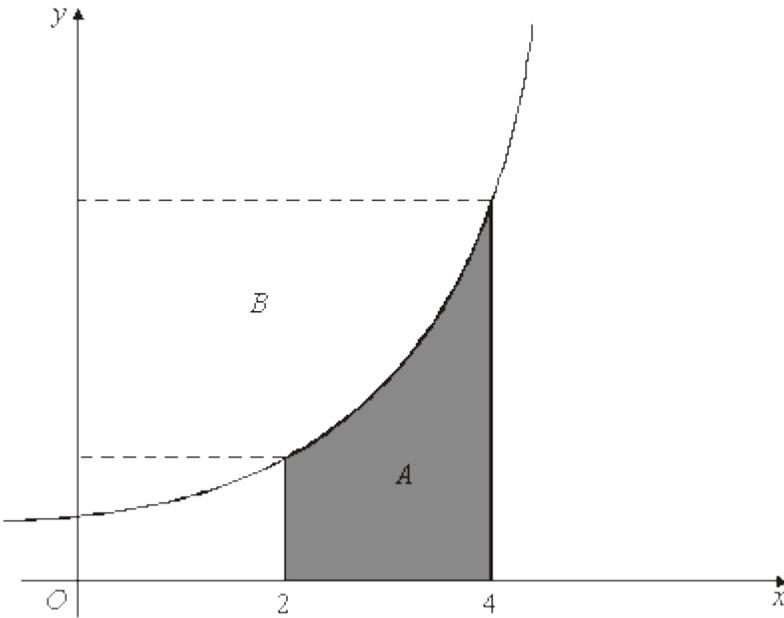
- (a) Use the mid-ordinate rule with four strips to find an estimate for $\int_1^5 \ln x \, dx$, giving your answer to three significant figures. (3)
- (b) (i) Given that $y = x \ln x$, find $\frac{dy}{dx}$. (2)
- (ii) Hence, or otherwise, find $\int \ln x \, dx$. (2)
- (iii) Find the exact value of $\int_1^5 \ln x \, dx$. (2)
- (Total 9 marks)

2

- (a) Sketch the graph of $y = \tan^{-1}x$. (2)
- (b) (i) By drawing a suitable straight line on your sketch, show that the equation $\tan^{-1}x = 2x - 1$ has only one root. (2)
- (ii) Given that the root of this equation is α , show that $0.8 < \alpha < 0.9$. (2)
- (c) Use the iteration $x_{n+1} = \frac{1}{2}(\tan^{-1}x_n + 1)$ with $x_1 = 0.8$ to find the value of x_3 , giving your answer to two significant figures. (3)
- (Total 9 marks)

3

The diagram shows part of the graph of $y = e^{2x} + 3$.



- (a) Describe a sequence of two geometrical transformations that maps the graph of $y = e^x$ onto the graph of $y = e^{2x} + 3$. (4)
- (b) Use the mid-ordinate rule with four strips of equal width to find an estimate for the area of the shaded region A , giving your answer to three significant figures. (4)
- (c) Find the exact value of the area of the shaded region A . (4)
- (d) The region B is indicated on the diagram.

Find the area of the region B , giving your answer in the form $pe^8 + qe^4$, where p and q are numbers to be determined.

(4)
(Total 16 marks)