3.

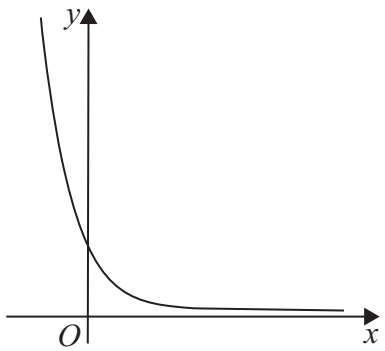


Figure 1

In this question you must show all stages of your working.
Solutions relying entirely on calculator technology are not acceptable.

Figure 1 shows a sketch of the curve with equation $y = 3 \times 2^{-x}$

The point $P(k, 300\,000)$ lies on the curve.

(a) Use logarithms to find the value of k to 2 decimal places.

(2)

x	–0.5	1	2.5	4.0	5.5	7
y	4.243	1.5	0.530	0.188	0.066	0.023

The table shows corresponding values of x and y for $y = 3 \times 2^{-x}$

The values of y are given to 3 decimal places where appropriate.

(b) (i) Use the trapezium rule, with all the values of y from the table, to find an approximate value, to 2 decimal places, for

$$\int_{-0.5}^{7} 3 \times 2^{-x} \, dx$$

(3)

(ii) Use your answer to part (b)(i) to estimate

$$\int_{-0.5}^{7} 2^{-x} \, dx + \int_{-7}^{0.5} 2^{x} \, dx$$

(2)

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Question 3 continued

Question 3 continued

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Question 3 continued

(Total for Question 3 is 7 marks)

4. **In this question you must show all stages of your working.**
Solutions relying on calculator technology are not acceptable.

$$f(x) = 4x^3 + 13x^2 - 10x + 8$$

(a) When $f(x)$ is divided by $(x - 2)$ the remainder is R and the quotient is $Q(x)$.

(i) Find $Q(x)$.

(ii) Find R.

(4)

(b) (i) Use the factor theorem to show that $(x + 4)$ is a factor of $f(x)$.

(ii) Hence prove, using algebra, that the equation $f(x) = 0$ has only one real solution.

(5)

(c) Find the range of values of x for which $f(x)$ is decreasing.

(3)

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