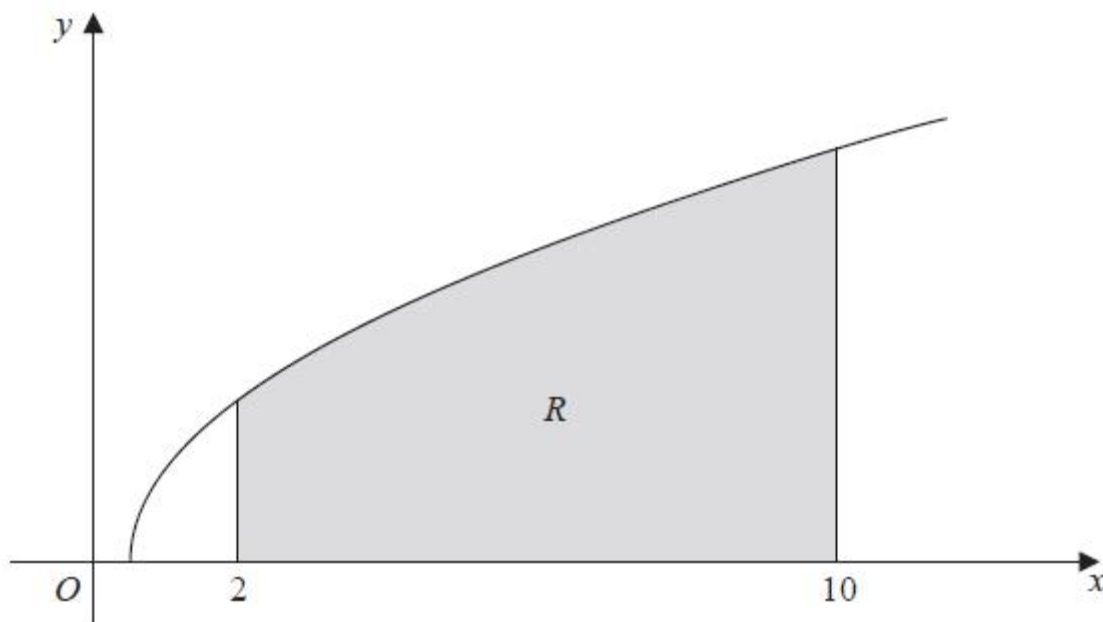




**The Trapezium Rule Exam Questions (Edexcel)**

Q1.



**Figure 1**

Figure 1 shows a sketch of part of the curve with equation  $y = \sqrt{2x - 1}$ ,  $x \geq 0.5$

The finite region  $R$ , shown shaded in Figure 1, is bounded by the curve, the  $x$ -axis and the lines with equations  $x = 2$  and  $x = 10$ .

The table below shows corresponding values of  $x$  and  $y$  for  $y = \sqrt{2x - 1}$ .

$x$	2	4	6	8	10
$y$	$\sqrt{3}$		$\sqrt{11}$		$\sqrt{19}$

- (a) Complete the table with the values of  $y$  corresponding to  $x = 4$  and  $x = 8$ . (1)
- (b) Use the trapezium rule, with all the values of  $y$  in the completed table, to find an approximate value for the area of  $R$ , giving your answer to 2 decimal places. (3)
- (c) State whether your approximate value in part (b) is an overestimate or an underestimate for the area of  $R$ . (1)

(Total 5 marks)

(Q13 6664/01/R, June 2014)



Q2.

The table below shows corresponding values of  $x$  and  $y$  for  $y = \log_3 2x$

The values of  $y$  are given to 2 decimal places as appropriate.

$x$	3	4.5	6	7.5	9
$y$	1.63	2	2.26	2.46	2.63

(a) Using the trapezium rule with all the values of  $y$  in the table, find an estimate for

$$\int_3^9 \log_3 2x \, dx$$

(3)

Using your answer to part (a) and making your method clear, estimate

(b) (i)  $\int_3^9 \log_3 (2x)^{10} \, dx$

(ii)  $\int_3^9 \log_3 18x \, dx$

(3)

(Total for question = 6 marks)

(Q05 9MA0/02, June 2022)



Q3.

(a) Complete the table below, giving values of  $\sqrt{(2^x + 1)}$  to 3 decimal places.

$x$	0	0.5	1	1.5	2	2.5	3
$\sqrt{(2^x + 1)}$	1.414	1.554	1.732	1.957			3

(2)

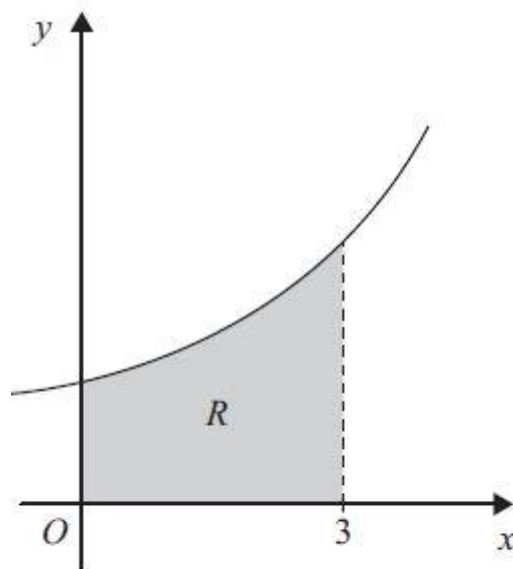


Figure 1

Figure 1 shows the region  $R$  which is bounded by the curve with equation  $y = \sqrt{(2^x + 1)}$ , the  $x$ -axis and the lines  $x = 0$  and  $x = 3$

(b) Use the trapezium rule, with all the values from your table, to find an approximation for the area of  $R$ .

(4)

(c) By reference to the curve in Figure 1 state, giving a reason, whether your approximation in part (b) is an overestimate or an underestimate for the area of  $R$ .

(2)

(Total 8 marks)

(Q13 6664/01, June 2009)



Q4.

(a)

$$y = 5^x + \log_2(x + 1), \quad 0 \leq x \leq 2$$

Complete the table below, by giving the value of  $y$  when  $x = 1$

$x$	0	0.5	1	1.5	2
$y$	1	2.821		12.502	26.585

(1)

(b) Use the trapezium rule, with all the values of  $y$  from the completed table, to find an approximate value for

$$\int_0^2 (5^x + \log_2(x + 1)) dx$$

giving your answer to 2 decimal places.

(4)

(c) Use your answer to part (b) to find an approximate value for

$$\int_0^2 (5 + 5^x + \log_2(x + 1)) dx$$

giving your answer to 2 decimal places.

(1)

(Total for question = 6 marks)

(Q13 6664/01, June 2017)



**Q5.**

A continuous curve has equation  $y = f(x)$ .

The table shows corresponding values of  $x$  and  $y$  for this curve, where  $a$  and  $b$  are constants.

$x$	3	3.2	3.4	3.6	3.8	4
$y$	$a$	16.8	$b$	20.2	18.7	13.5

The trapezium rule is used, with all the  $y$  values in the table, to find an approximate area under the curve between  $x = 3$  and  $x = 4$

Given that this area is 17.59

(a) show that  $a + 2b = 51$

(3)

Given also that the sum of all the  $y$  values in the table is 97.2

(b) find the value of  $a$  and the value of  $b$

(3)

**(Total for question = 6 marks)**

**(Q05 9MA0/01, June 2023)**

**Q6.**

The table below shows corresponding values of  $x$  and  $y$  for  $y = \sqrt{\frac{x}{1+x}}$

The values of  $y$  are given to 4 significant figures.

$x$	0.5	1	1.5	2	2.5
$y$	0.5774	0.7071	0.7746	0.8165	0.8452

(a) Use the trapezium rule, with all the values of  $y$  in the table, to find an estimate for

$$\int_{0.5}^{2.5} \sqrt{\frac{x}{1+x}} dx$$

giving your answer to 3 significant figures.

(3)

(b) Using your answer to part (a), deduce an estimate for  $\int_{0.5}^{2.5} \sqrt{\frac{9x}{1+x}} dx$

(1)

Given that

$$\int_{0.5}^{2.5} \sqrt{\frac{9x}{1+x}} dx = 4.535 \text{ to 4 significant figures}$$

(c) comment on the accuracy of your answer to part (b).

(1)

**(Total for question = 5 marks)**



Q7.

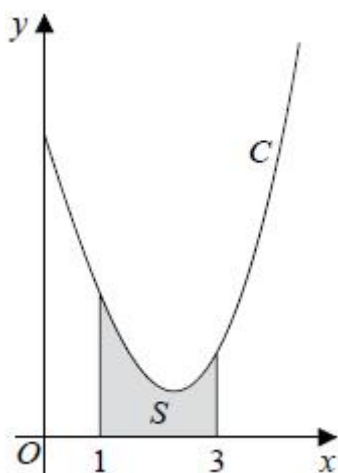


Figure 4

Figure 4 shows a sketch of part of the curve  $C$  with equation

$$y = \frac{x^2 \ln x}{3} - 2x + 5, \quad x > 0$$

The finite region  $S$ , shown shaded in Figure 4, is bounded by the curve  $C$ , the line with equation  $x = 1$ , the  $x$ -axis and the line with equation  $x = 3$

The table below shows corresponding values of  $x$  and  $y$  with the values of  $y$  given to 4 decimal places as appropriate.

$x$	1	1.5	2	2.5	3
$y$	3	2.3041	1.9242	1.9089	2.2958

- (a) Use the trapezium rule, with all the values of  $y$  in the table, to obtain an estimate for the area of  $S$ , giving your answer to 3 decimal places. (3)
- (b) Explain how the trapezium rule could be used to obtain a more accurate estimate for the area of  $S$ . (1)
- (c) Show that the exact area of  $S$  can be written in the form  $\frac{a}{b} + \ln c$ , where  $a$ ,  $b$  and  $c$  are integers to be found. (6)

(In part c, solutions based entirely on graphical or numerical methods are not acceptable.)

(Total for question = 10 marks)

(Q14 9MA0/01, Specimen papers)



Q8.

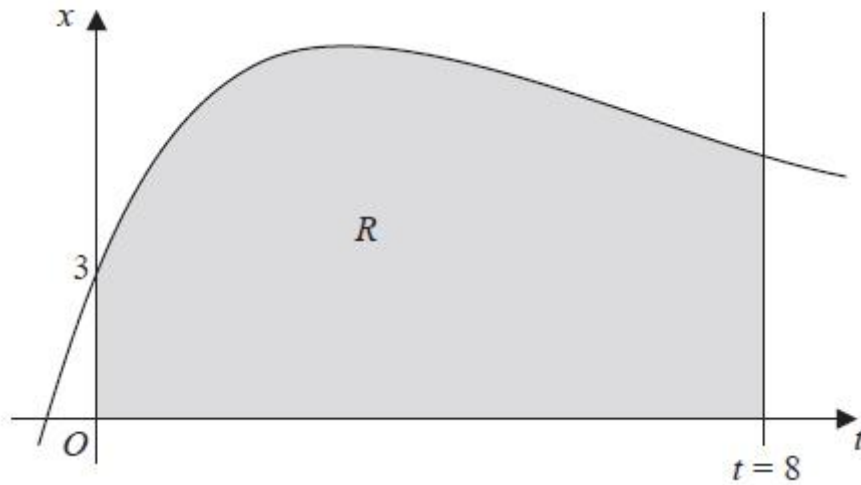


Figure 1

Figure 1 shows part of the curve with equation  $x = 4te^{-\frac{t}{4}} + 3$ . The finite region  $R$  shown shaded in Figure 1 is bounded by the curve, the  $x$ -axis, the  $t$ -axis and the line  $t = 8$ .

(a) Complete the table with the value of  $x$  corresponding to  $t = 6$ , giving your answer to 3 decimal places.

$t$	0	2	4	6	8
$x$	3	7.107	7.218		5.223

(1)

(b) Use the trapezium rule with all the values of  $x$  in the completed table to obtain an estimate for the area of the region  $R$ , giving your answer to 2 decimal places.

(3)

(c) Use calculus to find the exact value for the area of  $R$ .

(6)

(d) Find the difference between the values obtained in part (b) and part (c), giving your answer to 2 decimal places.

(1)

(Total 11 marks)

(Q31 6666/01/R, June 2013)



Q9.

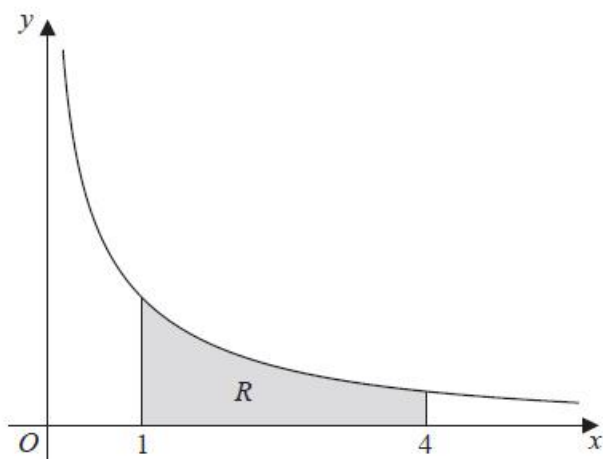


Figure 1

Figure 1 shows a sketch of part of the curve with equation  $y = \frac{10}{2x + 5\sqrt{x}}$ ,  $x > 0$

The finite region  $R$ , shown shaded in Figure 1, is bounded by the curve, the  $x$ -axis, and the lines with equations  $x = 1$  and  $x = 4$

The table below shows corresponding values of  $x$  and  $y$  for  $y = \frac{10}{2x + 5\sqrt{x}}$

$x$	1	2	3	4
$y$	1.42857	0.90326		0.55556

(a) Complete the table above by giving the missing value of  $y$  to 5 decimal places.

(1)

(b) Use the trapezium rule, with all the values of  $y$  in the completed table, to find an estimate for the area of  $R$ , giving your answer to 4 decimal places.

(3)

(c) By reference to the curve in Figure 1, state, giving a reason, whether your estimate in part (b) is an overestimate or an underestimate for the area of  $R$ .

(1)

(d) Use the substitution  $u = \sqrt{x}$ , or otherwise, to find the exact value of

$$\int_1^4 \frac{10}{2x + 5\sqrt{x}} dx$$

(6)

(Total 11 marks)

(Q32 6666/01, June 2014)



Q10.

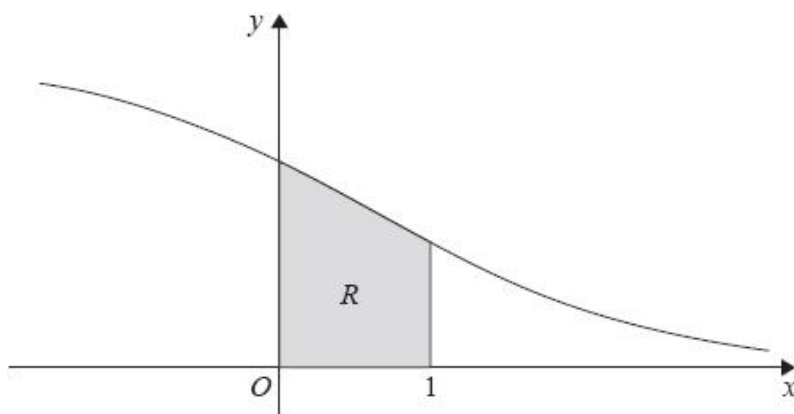


Figure 1

Figure 1 shows a sketch of part of the curve with equation  $y = \frac{6}{(e^x + 2)}$ ,  $x \in \mathbb{R}$

The finite region  $R$ , shown shaded in Figure 1, is bounded by the curve, the  $y$ -axis, the  $x$ -axis and the line with equation  $x = 1$

The table below shows corresponding values of  $x$  and  $y$  for  $y = \frac{6}{(e^x + 2)}$

$x$	0	0.2	0.4	0.6	0.8	1
$y$	2		1.71830	1.56981	1.41994	1.27165

- (a) Complete the table above by giving the missing value of  $y$  to 5 decimal places. (1)
- (b) Use the trapezium rule, with all the values of  $y$  in the completed table, to find an estimate for the area of  $R$ , giving your answer to 4 decimal places. (3)
- (c) Use the substitution  $u = e^x$  to show that the area of  $R$  can be given by
- $$\int_a^b \frac{6}{u(u+2)} du$$
- where  $a$  and  $b$  are constants to be determined. (2)
- (d) Hence use calculus to find the exact area of  $R$ .  
 [Solutions based entirely on graphical or numerical methods are not acceptable.] (6)

(Total for question = 12 marks)

(Q32 6666/01, June 2017)