





2.

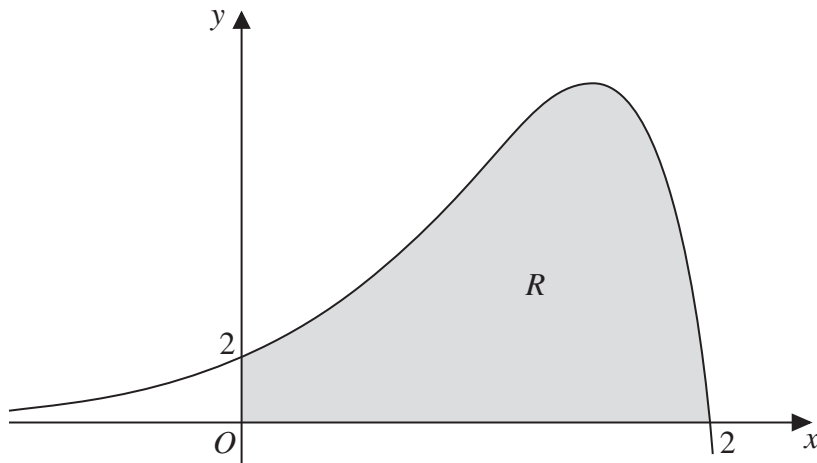


Figure 1

Figure 1 shows a sketch of part of the curve with equation

$$y = (2 - x)e^{2x}, \quad x \in \mathbb{R}$$

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

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

$x$	0	0.5	1	1.5	2
$y$	2	4.077	7.389	10.043	0

- (a) Use the trapezium rule with all the values of  $y$  in the table, to obtain an approximation for the area of  $R$ , giving your answer to 2 decimal places. (3)
- (b) Explain how the trapezium rule can be used to give a more accurate approximation for the area of  $R$ . (1)
- (c) Use calculus, showing each step in your working, to obtain an exact value for the area of  $R$ . Give your answer in its simplest form. (5)

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8.

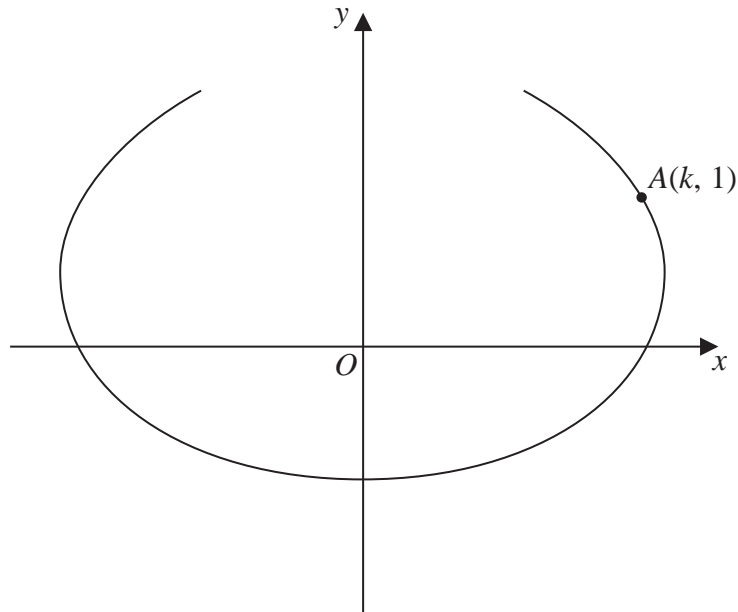


Figure 3

The curve shown in Figure 3 has parametric equations

$$x = t - 4 \sin t, \quad y = 1 - 2 \cos t, \quad -\frac{2\pi}{3} \leq t \leq \frac{2\pi}{3}$$

The point A, with coordinates  $(k, 1)$ , lies on the curve.

Given that  $k > 0$

(a) find the exact value of  $k$ , (2)

(b) find the gradient of the curve at the point A. (4)

There is one point on the curve where the gradient is equal to  $-\frac{1}{2}$

(c) Find the value of  $t$  at this point, showing each step in your working and giving your answer to 4 decimal places.

[Solutions based entirely on graphical or numerical methods are not acceptable.] (6)

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