Area under Parametric Curves 2 - Edexcel Past Exam Questions

1.

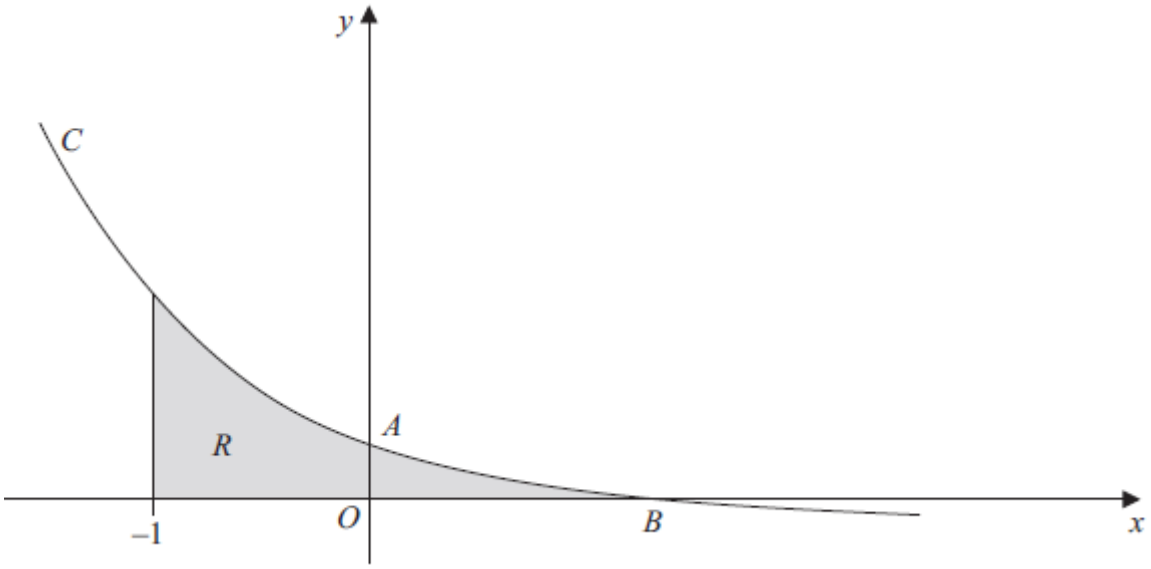

Figure 2

Figure 2 shows a sketch of part of the curve C with parametric equations

$$x = 1 - \frac{1}{2}t, \qquad y = 2^t - 1.$$

The curve crosses the y-axis at the point A and crosses the x-axis at the point B.

(a) Show that A has coordinates (0, 3). **(2)**

(b) Find the x-coordinate of the point B. **(2)**

(c) Find an equation of the normal to C at the point A. **(5)**

The region R, as shown shaded in Figure 2, is bounded by the curve C, the line $x = -1$ and the x-axis.

(d) Use integration to find the exact area of R. **(6)**

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2.

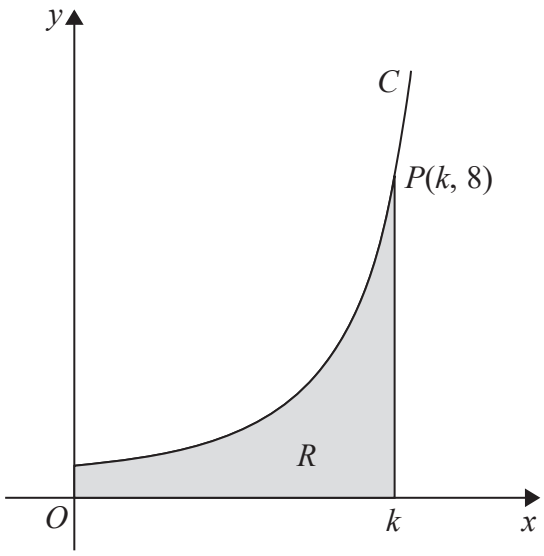

Diagram not drawn to scale

Figure 4

Figure 4 shows a sketch of part of the curve C with parametric equations

$$x = 3\theta\sin\theta, \qquad y = \sec^3\theta, \qquad 0 \leqslant \theta < \frac{\pi}{2}$$

The point $P(k, 8)$ lies on C, where k is a constant.

(a) Find the exact value of k. **(2)**

The finite region R, shown shaded in Figure 4, is bounded by the curve C, the y-axis, the x-axis and the line with equation $x = k$.

(b) Show that the area of R can be expressed in the form

$$\lambda\int_{\alpha}^{\beta}(\theta\sec^2\theta + \tan\theta\sec^2\theta)\,\mathrm{d}\theta$$

where λ, α and β are constants to be determined. **(4)**

(c) Hence use integration to find the exact value of the area of R. **(6)**

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