Finding Areas using Integration - Edexcel Past Exam Questions

1.

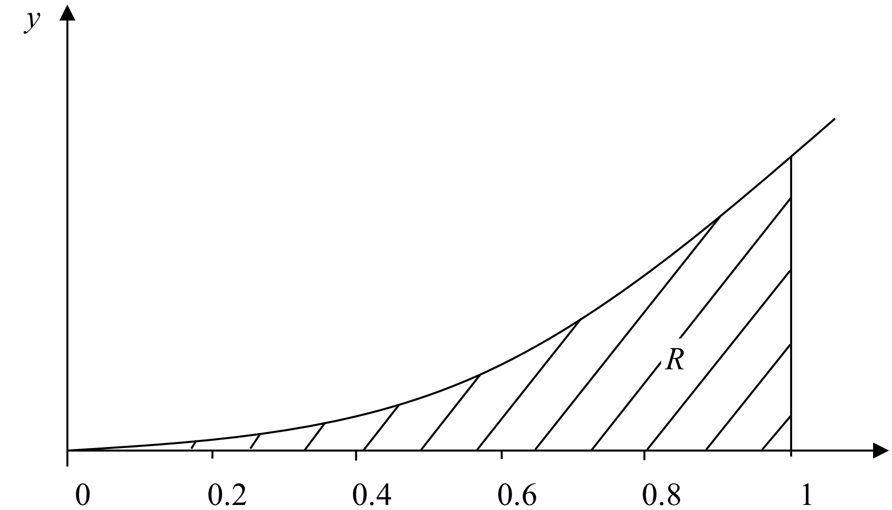

Figure 1

Figure 1 shows the graph of the curve with equation

$$y = xe^{2x}, \qquad x \geq 0.$$

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

Use integration to find the exact value of the area for R. **(5)**

June 05 Q5*(edited)*

2.

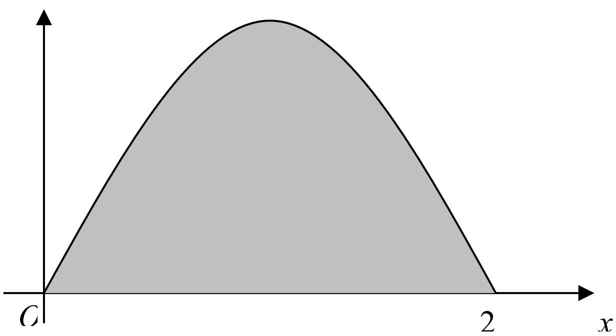

Figure 3

The curve with equation $y = 3 \sin \frac{x}{2}$, $0 \leq x \leq 2\pi$, is shown in Figure 1. The finite region enclosed by the curve and the x-axis is shaded.

Find, by integration, the area of the shaded region. **(3)**

June 06 Q3*(edited)*

3. **Figure 3**

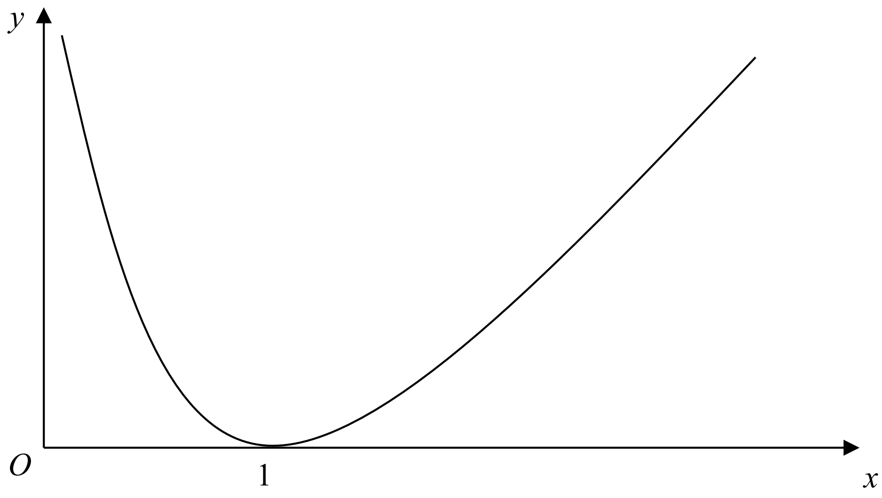

Figure 3 shows a sketch of the curve with equation $y = (x - 1) \ln x$, $x > 0$.

Given that $I = \int_1^3 (x-1) \ln x \, dx$,

Show, by integration, that the exact value of $\int_1^3 (x-1) \ln x \, dx$ is $\frac{3}{2} \ln 3$. **(6)**

June 06 Q6 *(edited)*

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4. $$I = \int_0^5 e^{\sqrt{(3x+1)}} \, dx.$$

(*a*) Use the substitution $t = \sqrt{(3x + 1)}$ to show that I may be expressed as $\int_a^b kte^t \, dt$, giving the values of a, b and k. **(5)**

(*b*) Use integration by parts to evaluate this integral, and hence find the value of I correct to 4 significant figures, showing all the steps in your working.
(5)

Jan 07 Q8*(edited)*

5.

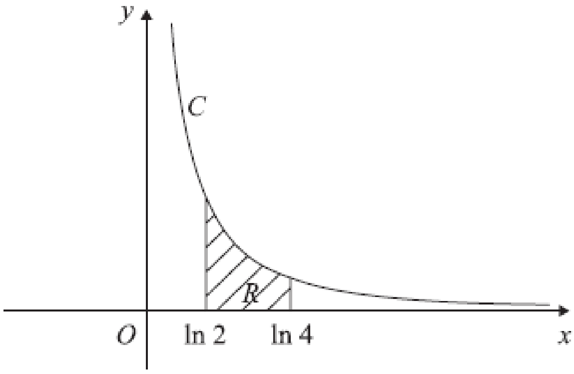

Figure 3

The curve C has parametric equations

$$x = \ln(t + 2), \quad y = \frac{1}{(t+1)}, \quad t > -1.$$

The finite region R between the curve C and the x-axis, bounded by the lines with equations $x = \ln 2$ and $x = \ln 4$, is shown shaded in Figure 3.

(a) Show that the area of R is given by the integral

$$\int_0^2 \frac{1}{(t+1)(t+2)} \, dt.$$ **(4)**

(b) Hence find an exact value for this area. **(6)**

(c) Find a cartesian equation of the curve C, in the form $y = f(x)$. **(4)**

(d) State the domain of values for x for this curve. **(1)**

Jan 08 Q7

6.

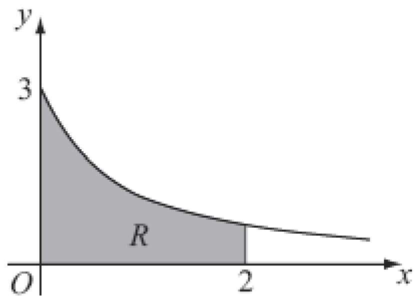

Figure 1

Figure 1 shows part of the curve $y = \dfrac{3}{\sqrt{(1+4x)}}$. The region R is bounded by the curve, the x-axis, and the lines $x = 0$ and $x = 2$, as shown shaded in Figure 1.

Use integration to find the area of R. **(4)**

Jan 09 Q2*(edited)*

7.

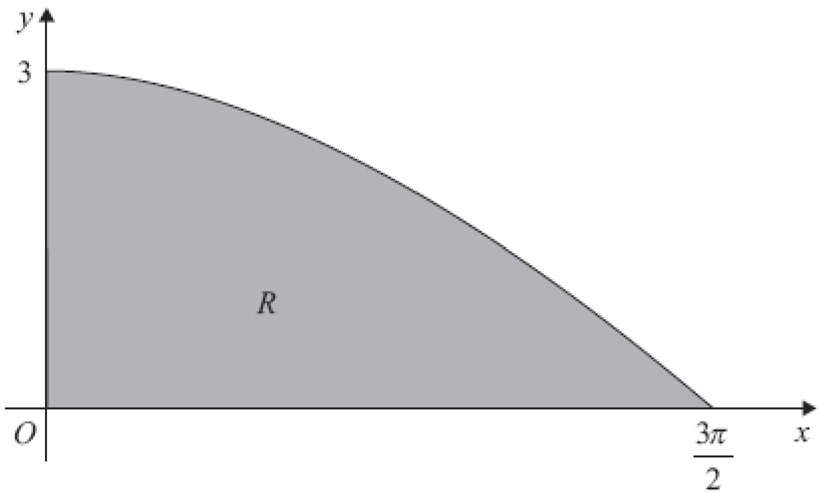

Figure 1

Figure 1 shows the finite region R bounded by the x-axis, the y-axis and the curve with equation $y = 3\cos\left(\dfrac{x}{3}\right)$, $0 \leq x \leq \dfrac{3\pi}{2}$.

(*a*) Use integration to find the exact area of R. **(3)**

June 09 Q2 *(edited)*

8.

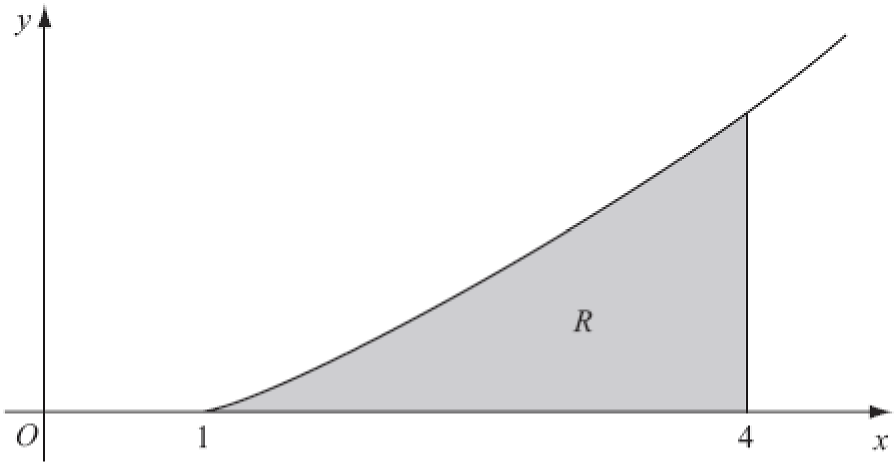

Figure 1

Figure 1 shows a sketch of the curve with equation $y = x \ln x$, $x \geq 1$. The finite region R, shown shaded in Figure 1, is bounded by the curve, the x-axis and the line $x = 4$.

(*a*) (i) Use integration by parts to find $\int x \ln x \, \mathrm{d}x$.

(ii) Hence find the exact area of R, giving your answer in the form $\frac{1}{4}(a \ln 2 + b)$, where a and b are integers. **(7)**

Jan10 Q2*(edited)*

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9. $$I = \int_2^5 \frac{1}{4 + \sqrt{(x-1)}} \, \mathrm{d}x.$$

Using the substitution $x = (u - 4)^2 + 1$, or otherwise, and integrating, find the exact value of I. **(8)**

Jan 11 Q7*(edited)*

10.

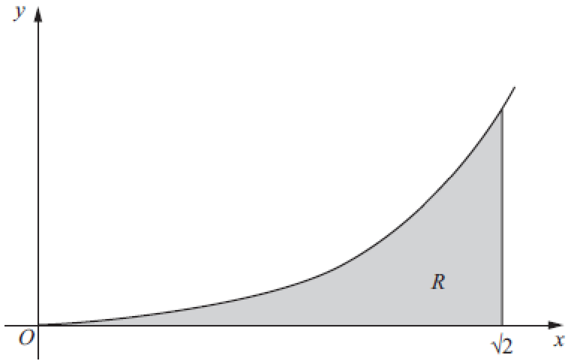

Figure 2

Figure 2 shows a sketch of the curve with equation $y = x^3 \ln (x^2 + 2)$, $x \geq 0$.

The finite region R, shown shaded in Figure 2, is bounded by the curve, the x-axis and the line $x = \sqrt{2}$.

(*a*) Use the substitution $u = x^2 + 2$ to show that the area of R is

$$\frac{1}{2}\int_2^4 (u-2)\ln u \ \mathrm{d}u. \qquad \textbf{(4)}$$

(*b*) Hence, or otherwise, find the exact area of R. **(6)**

June 11 Q4*(edited)*