# Finding Areas using Integration - Edexcel Past Exam Questions

**1.**

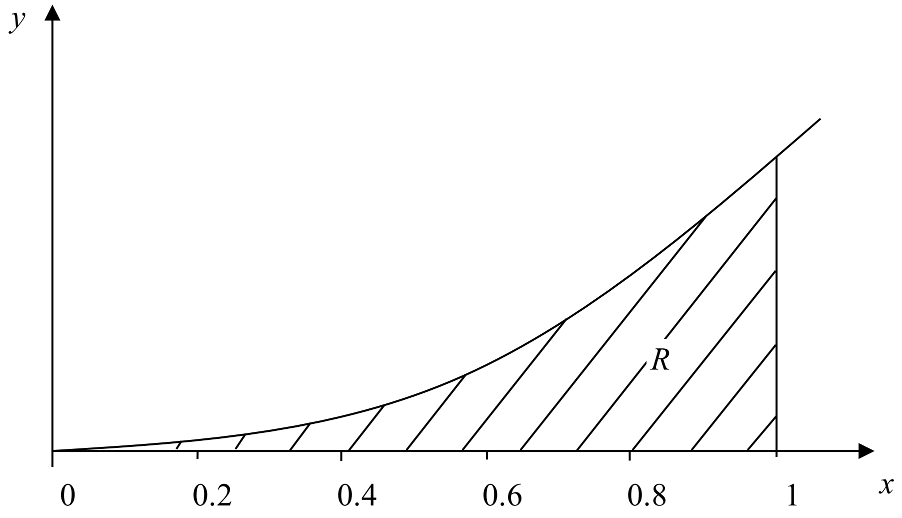


**Figure 1**

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.**

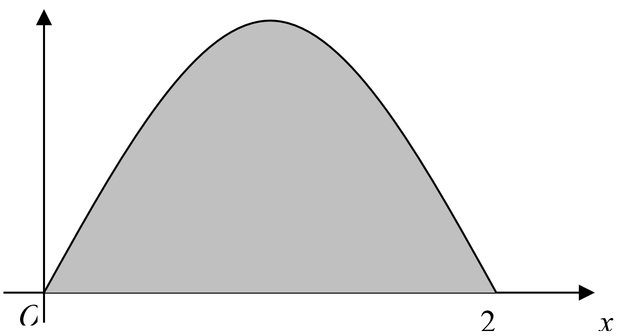


**Figure 3**

The curve with equation $y = 3 \sin \dfrac{x}{2}$, $0 \leq x \leq 2\pi$, 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**

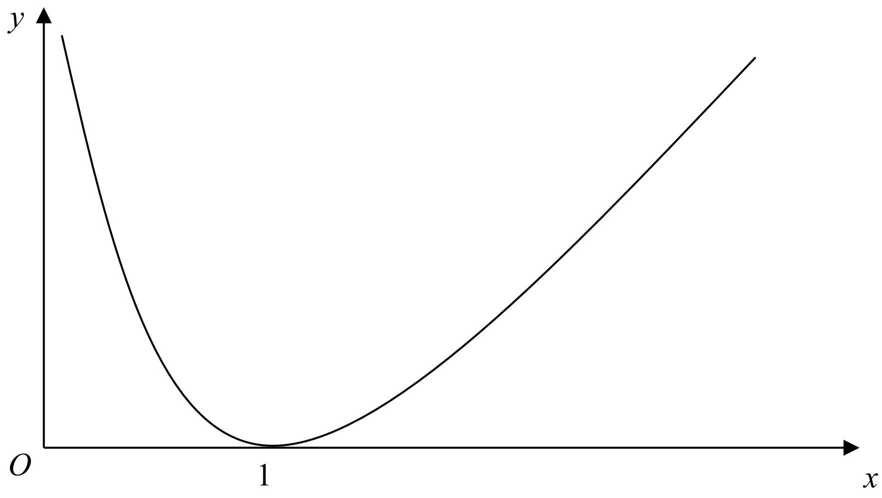


Figure 3 shows a sketch of the curve with equation $y = (x - 1)\ln x,\ x > 0$.

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

(*d*) 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.**

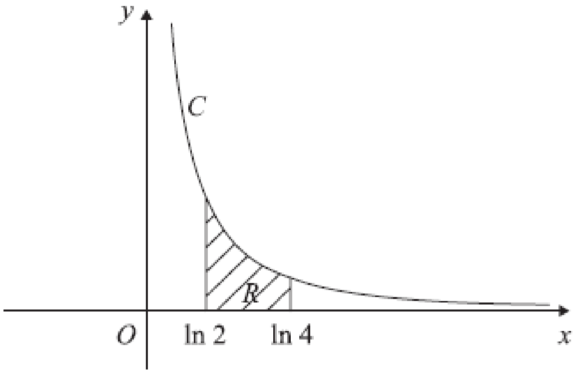


**Figure 3**

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

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

($b$) 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.**

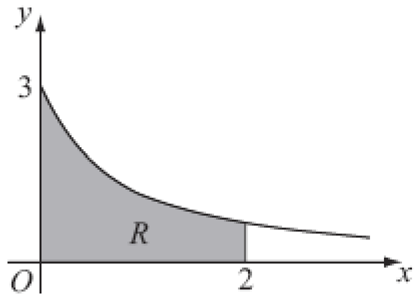


**Figure 1**

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.**

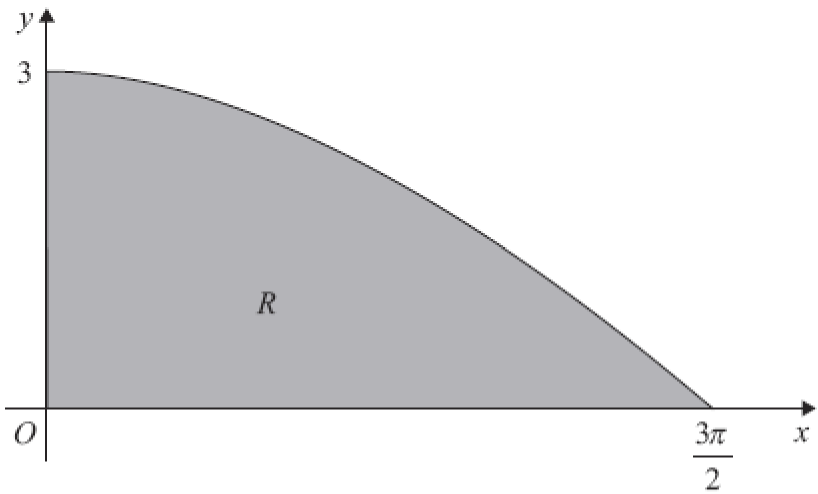


**Figure 1**

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.**

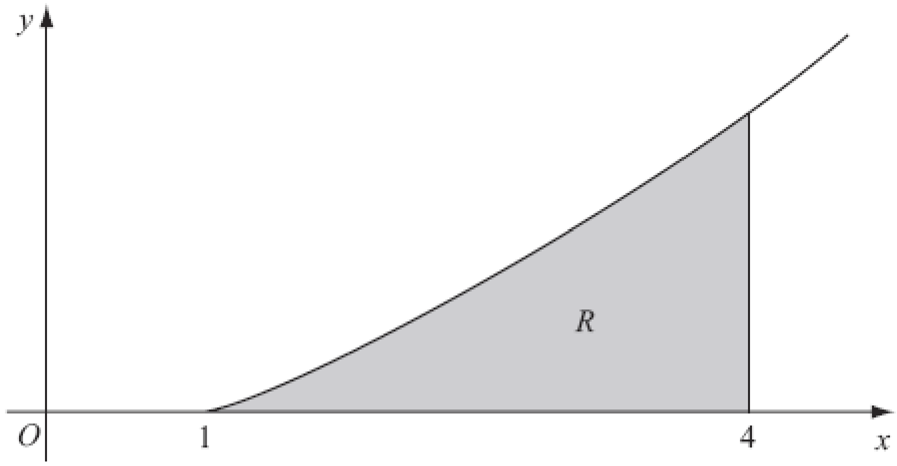


**Figure 1**

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 $\int x \ln x \; dx$.

(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)***

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

Using the substitution $x = (u - 4)^2 + 1$, or otherwise, and integrating, find the exact value of $I$.
**(8)**
**Jan 11 Q7*(edited)***

**10.**

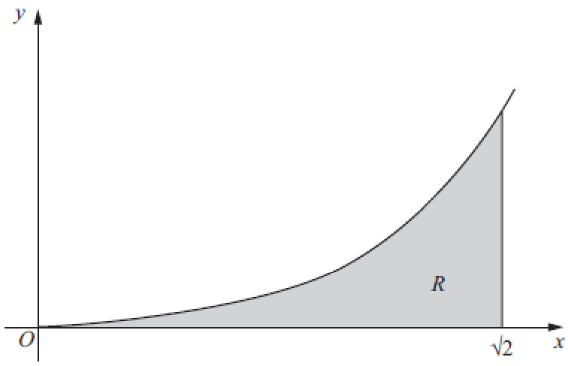


**Figure 2**

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

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

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

**June 11 Q4*(edited)***