

- 1 In each part of this question, the table gives values of a function correct to 2 decimal places. Give your answers correct to 1 decimal place.

a Use Simpson's rule with two strips to estimate the value of  $\int_0^2 f(x) dx$ .

$x$	0	1	2
$f(x)$	4.21	6.06	7.41

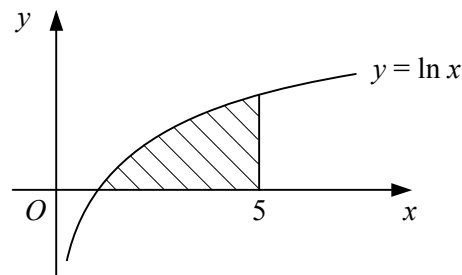
b Use Simpson's rule with four strips to estimate the value of  $\int_3^{11} g(x) dx$ .

$x$	3	5	7	9	11
$g(x)$	3.98	3.34	3.06	2.98	3.23

c Use Simpson's rule with six strips to estimate the value of  $\int_1^7 h(x) dx$ .

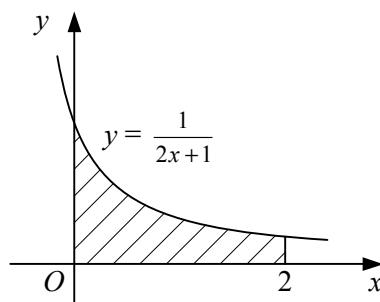
$x$	1	2	3	4	5	6	7
$h(x)$	0.46	1.11	1.17	1.05	0.80	0.62	0.91

2



The shaded region in the diagram is bounded by the curve  $y = \ln x$ , the  $x$ -axis and the line  $x = 5$ . Use Simpson's rule with four intervals of equal width to estimate the area of the shaded region.

3



The shaded region in the diagram is bounded by the curve  $y = \frac{1}{2x+1}$ , the coordinate axes and the line  $x = 2$ .

- Use Simpson's rule with four strips to estimate the area of the shaded region.
- Use integration to find the exact area of the shaded region.
- Show that there is less than 1% error in the estimate made in part a.

4 Use Simpson's rule with  $n$  intervals of equal width to estimate the value of each integral.

a  $\int_0^{\frac{\pi}{3}} \tan^2 x \, dx \quad n = 2$                       b  $\int_1^5 x \ln(x+1) \, dx \quad n = 2$

c  $\int_2^6 \frac{x}{x^2-2} \, dx \quad n = 4$                       d  $\int_0^1 \sqrt{3+\sin x} \, dx \quad n = 4$

e  $\int_{-3}^3 (2^x - x) \, dx \quad n = 6$                       f  $\int_0^6 x^3 e^{-x} \, dx \quad n = 6$

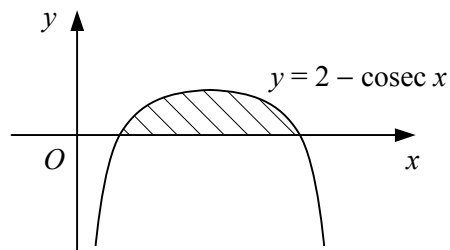
5  $f(x) \equiv e^{x^2-1}, x \in \mathbb{R}, x \geq 0.$

a Evaluate  $ff(0)$ .

b Find an expression for  $f^{-1}(x)$ .

c Use Simpson's rule with four strips to find an approximate value for  $\int_0^2 f(x) \, dx$ .

6



The diagram shows the curve with equation  $y = 2 - \operatorname{cosec} x$ ,  $0 < x < \pi$ .

a Find the exact  $x$ -coordinates of the points where the curve crosses the  $x$ -axis.

b Use Simpson's rule with four intervals of equal width to estimate the area of the shaded region bounded by the curve and the  $x$ -axis.

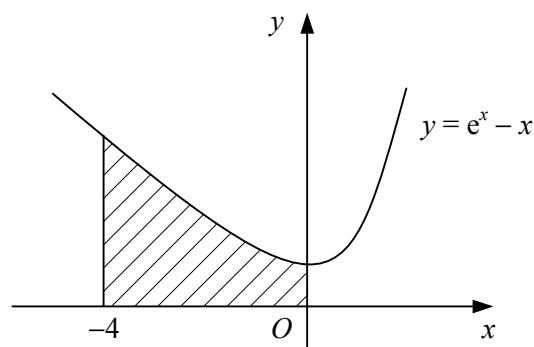
7 a Use Simpson's rule to estimate the value of the integral  $\int_0^2 \frac{4}{\sqrt{3x+2}} \, dx$

i with two strips,

ii with four strips.

b Find the exact value of the integral.

8



The shaded region in the diagram is bounded by the curve  $y = e^x - x$ , the coordinate axes and the line  $x = -4$ .

a Find the exact area of the shaded region.

b Use Simpson's rule with four intervals of equal width to estimate the volume of the solid formed when the shaded region is rotated completely about the  $x$ -axis.