1.

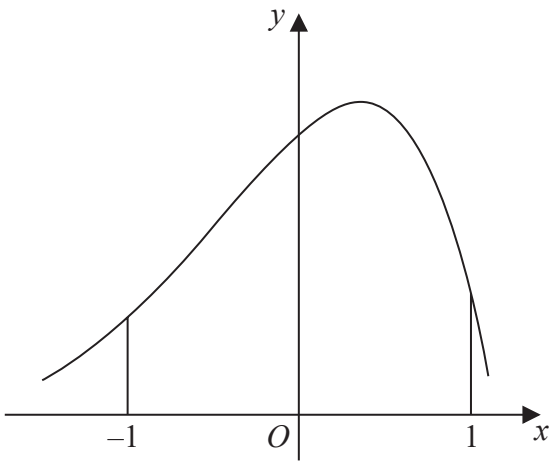


Figure 1

Figure 1 shows a sketch of part of the curve with equation $y = \mathrm{f}(x)$

The table below shows some corresponding values of x and y for this curve.

The values of y are given to 3 decimal places.

x	–1	–0.5	0	0.5	1
y	2.287	4.470	6.719	7.291	2.834

Using the trapezium rule with all the values of y in the given table,

(a) obtain an estimate for

$$\int_{-1}^{1} \mathrm{f}(x)\,\mathrm{d}x$$

giving your answer to 2 decimal places.

(3)

(b) Use your answer to part (a) to estimate

(i) $\displaystyle\int_{-1}^{1} \left(\mathrm{f}(x) - 2\right)\mathrm{d}x$

(ii) $\displaystyle\int_{1}^{3} \mathrm{f}(x-2)\,\mathrm{d}x$

(3)

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Question 1 continued

(Total for Question 1 is 6 marks)

2. **In this question you must show all stages of your working.**

Solutions based entirely on calculator technology are not acceptable.

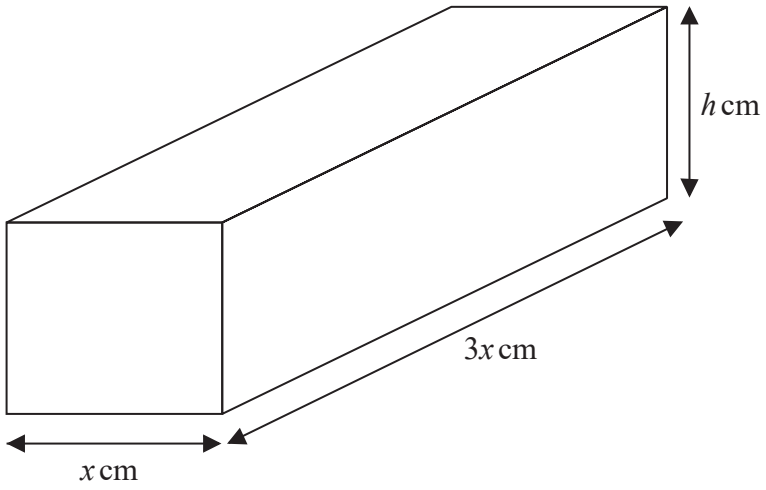


Figure 2

A brick is in the shape of a cuboid with width x cm, length $3x$ cm and height h cm, as shown in Figure 2.

The volume of the brick is 972 cm^3

(a) Show that the surface area of the brick, S cm^2, is given by

$$S = 6x^2 + \frac{2592}{x}$$

(3)

(b) Find $\dfrac{\mathrm{d}S}{\mathrm{d}x}$

(1)

(c) Hence find the value of x for which S is stationary.

(2)

(d) Find $\dfrac{\mathrm{d}^2S}{\mathrm{d}x^2}$ and hence show that the value of x found in part (c) gives the minimum value of S.

(2)

(e) Hence find the minimum surface area of the brick.

(1)

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