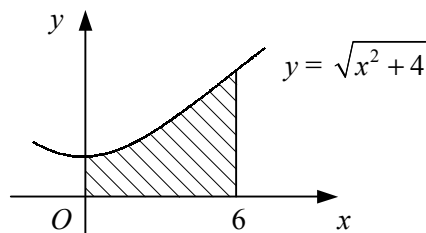


1 Evaluate

a  $\int_1^4 \frac{2}{x^2} dx$ , (3)

b  $\int_0^2 (x-3)^2 dx$ . (4)

2



The shaded region in the diagram is bounded by the curve  $y = \sqrt{x^2 + 4}$ , the x-axis and the lines  $x = 0$  and  $x = 6$ .

a Use the trapezium rule with three intervals of equal width to estimate the area of the shaded region. (5)

b State, with a reason, whether your answer to part a is an under-estimate or an over-estimate of the true area. (2)

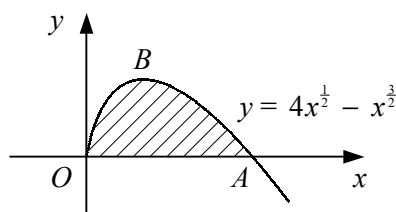
3

$$f(x) \equiv 3x^{\frac{1}{2}} - x^{-\frac{1}{2}}.$$

a Find the value of  $f(2)$ , giving your answer in the form  $k\sqrt{2}$  where  $k$  is an exact fraction. (2)

b Show that  $\int_3^4 f(x) dx = 12 - 4\sqrt{3}$ . (4)

4



The diagram shows the curve with the equation  $y = 4x^{\frac{1}{2}} - x^{\frac{3}{2}}$ .

The curve meets the x-axis at the origin,  $O$ , and at the point  $A$ .

a Find the coordinates of the point  $A$ . (2)

The curve has a maximum at the point  $B$ .

b Find the x-coordinate of the point  $B$ . (5)

c Find the area of the shaded region enclosed by the curve and the x-axis. (4)

5 The curve  $y = 4 + \frac{1}{x}$  crosses the x-axis at the point  $(p, 0)$  and has an asymptote  $y = q$ .

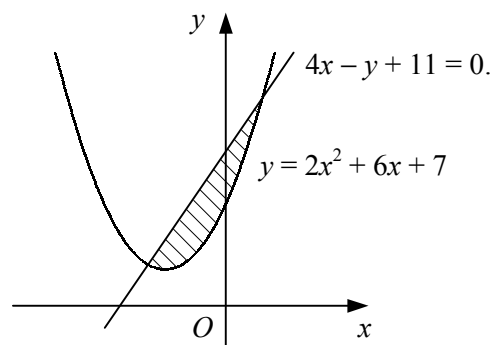
a Write down the values of  $p$  and  $q$ . (2)

b Sketch the curve. (2)

The region  $R$  is bounded by the curve  $y = 4 + \frac{1}{x}$ , the x-axis and the lines  $x = 1$  and  $x = 3$ .

c Use the trapezium rule with 5 equally-spaced ordinates to estimate the area of  $R$ . (5)

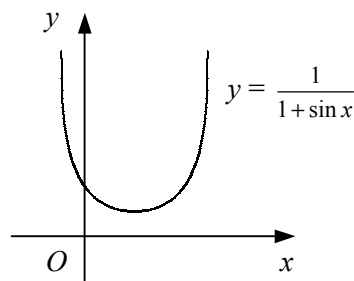
6



The diagram shows the curve with the equation  $y = 2x^2 + 6x + 7$  and the straight line with the equation  $4x - y + 11 = 0$ .

- a Find the coordinates of the points where the curve and line intersect. (5)
- b Find the area of the shaded region enclosed by the curve and the line. (6)

7



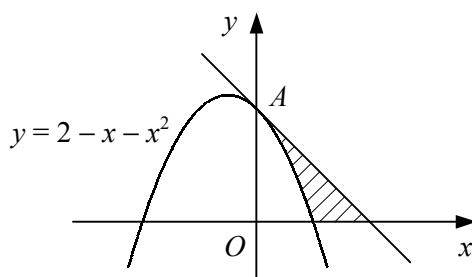
The diagram shows the curve with equation  $y = \frac{1}{1 + \sin x}$ ,  $-\frac{\pi}{2} < x < \frac{3\pi}{2}$ .

- a Find the coordinates of the minimum point of the curve. (3)
- b Use the trapezium rule with 2 intervals of equal width to estimate the area of the region bounded by the curve, the coordinate axes and the line  $x = \frac{\pi}{3}$ . (5)

8

- a Expand  $(1 + \frac{x}{10})^{12}$  in ascending powers of  $x$  up to and including the term in  $x^3$ , simplifying each coefficient in the expansion. (4)
- b Using your series expansion from part a, find an estimate for  $\int_0^1 (1 + \frac{x}{10})^{12} dx$ . (5)

9



The diagram shows the curve with the equation  $y = 2 - x - x^2$  and the tangent to the curve at the point A where it crosses the  $y$ -axis.

- a Find an equation of the tangent to the curve at A. (4)
- b Show that the area of the shaded region enclosed by the curve, the tangent to the curve at A and the  $x$ -axis is  $\frac{5}{6}$ . (9)