

7.

Figure 1

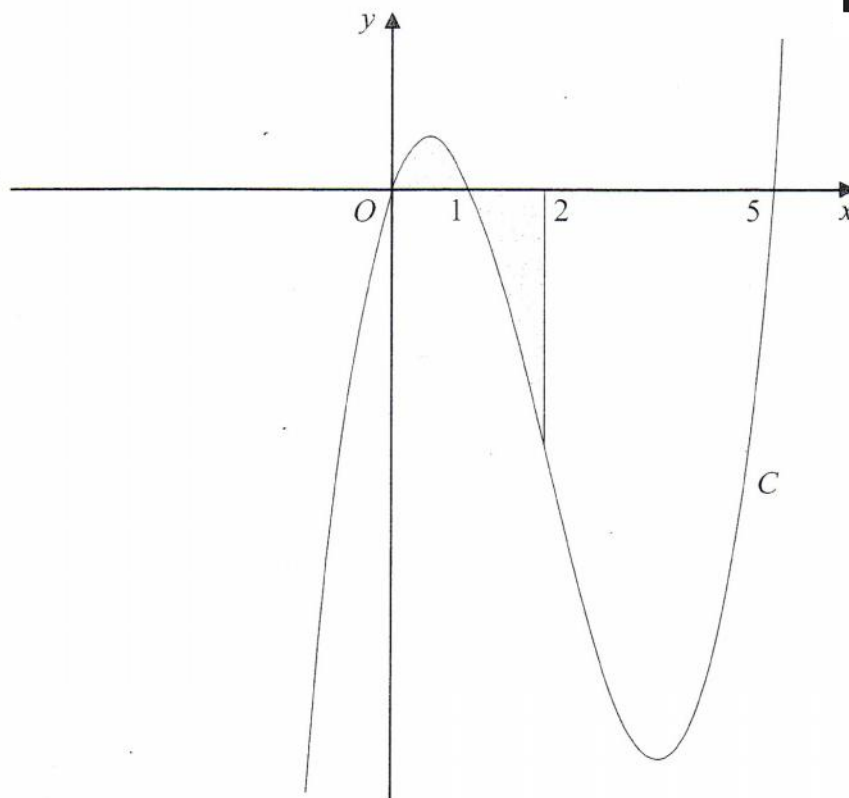


Figure 1 shows a sketch of part of the curve C with equation

$$y = x(x-1)(x-5).$$

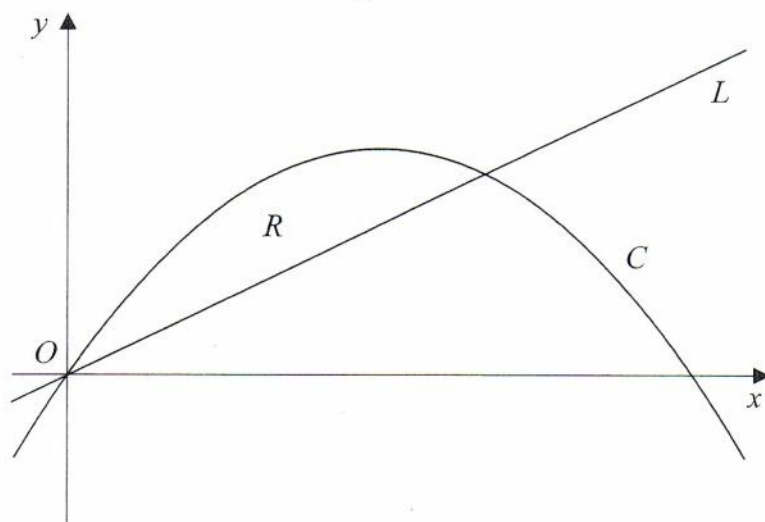
Use calculus to find the total area of the finite region, shown shaded in Figure 1, that is between $x=0$ and $x=2$ and is bounded by C , the x -axis and the line $x=2$.

(9)



7.

Figure 2



In Figure 2 the curve C has equation $y = 6x - x^2$ and the line L has equation $y = 2x$.

(a) Show that the curve C intersects the x -axis at $x = 0$ and $x = 6$. (1)

(b) Show that the line L intersects the curve C at the points $(0, 0)$ and $(4, 8)$. (3)

The region R , bounded by the curve C and the line L , is shown shaded in Figure 2.

(c) Use calculus to find the area of R . (6)



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Figure 1 shows part of the curve C with equation $y = (1+x)(4-x)$.

Use calculus to find the exact area of R .

A Cartesian coordinate system with x and y axes. A parabola, labeled C , opens upwards. It intersects the x-axis at two points, L and M , where L is to the left of M . A line segment connects the point $N(5, 4)$ on the parabola to the point L on the x-axis. The region R is the shaded area bounded by the parabola C , the x-axis, and the line segment LN .

The curve C has equation $y = x^2 - 5x + 4$. It cuts the x -axis at the points L and M as shown in Figure 2.

- The finite region R is bounded by LN , LM and the curve C as shown in Figure 2.

- (d) Use your answer to part (c) to find the exact value of the area of R . (5)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

4.

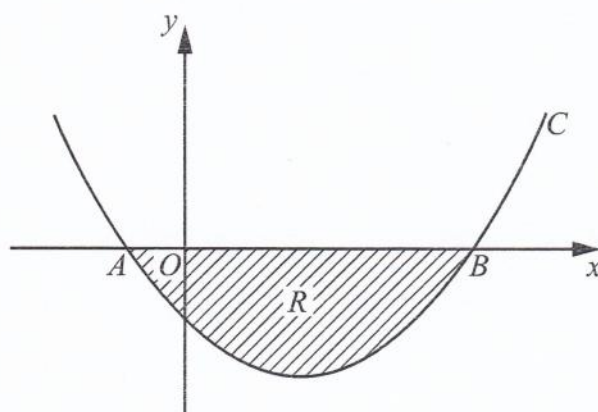
**Figure 1**

Figure 1 shows a sketch of part of the curve C with equation

$$y = (x+1)(x-5)$$

The curve crosses the x -axis at the points A and B .

(a) Write down the x -coordinates of A and B .

(1)

The finite region R , shown shaded in Figure 1, is bounded by C and the x -axis.

(b) Use integration to find the area of R .

(6)



6.

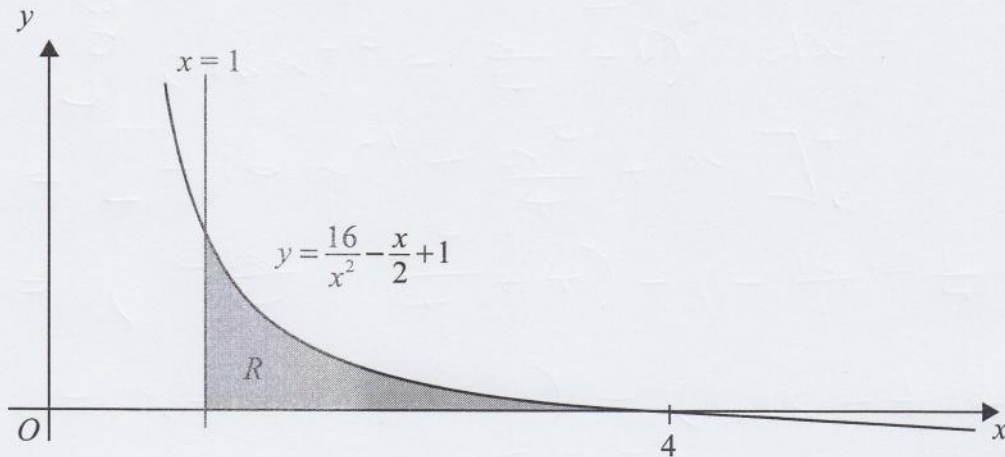


Figure 1

Figure 1 shows the graph of the curve with equation

$$y = \frac{16}{x^2} - \frac{x}{2} + 1, \quad x > 0$$

The finite region R , bounded by the lines $x = 1$, the x -axis and the curve, is shown shaded in Figure 1. The curve crosses the x -axis at the point $(4, 0)$.

(a) Complete the table with the values of y corresponding to $x = 2$ and 2.5

x	1	1.5	2	2.5	3	3.5	4
y	16.5	7.361			1.278	0.556	0

(2)

(b) Use the trapezium rule with all the values in the completed table to find an approximate value for the area of R , giving your answer to 2 decimal places.

(4)

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

(5)



A Cartesian coordinate system with a horizontal x -axis and a vertical y -axis. The origin is labeled O . A curve starts from the left, crosses the y -axis, reaches a peak at point A , and then descends. The region bounded by the y -axis, the curve, and a line segment from the origin O to point A is shaded with diagonal lines and labeled R .

Figure 2 shows a sketch of part of the curve with equation $y = 10 + 8x + x^2 - x^3$.

(a) Using calculus, show that the x -coordinate of A is 2.

The region R , shown shaded in Figure 2, is bounded by the curve, the y -axis and the line from O to A , where O is the origin.

(b) Using calculus, find the exact area of R .

Figure 2 shows a sketch of part of the curve C with equation

where k is a constant.

The point P on C is the maximum turning point.

Given that the x -coordinate of P is 2,

- (3)

The line through P parallel to the x -axis cuts the y -axis at the point N .

The region R is bounded by C , the y -axis and PN , as shown shaded in Figure 2.

- (6)

10.

Figure 3

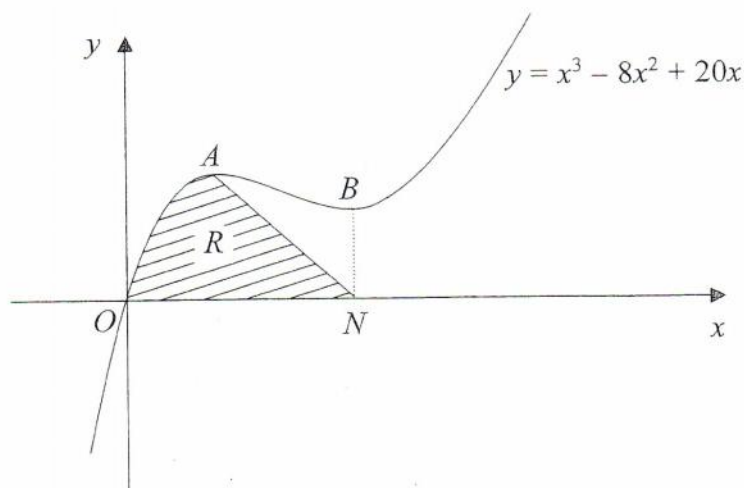


Figure 3 shows a sketch of part of the curve with equation $y = x^3 - 8x^2 + 20x$. The curve has stationary points A and B .

- (a) Use calculus to find the x -coordinates of A and B . (4)
- (b) Find the value of $\frac{d^2y}{dx^2}$ at A , and hence verify that A is a maximum. (2)

The line through B parallel to the y -axis meets the x -axis at the point N . The region R , shown shaded in Figure 3, is bounded by the curve, the x -axis and the line from A to N .

- (c) Find $\int (x^3 - 8x^2 + 20x) dx$. (3)
- (d) Hence calculate the exact area of R . (5)



10.

Figure 3

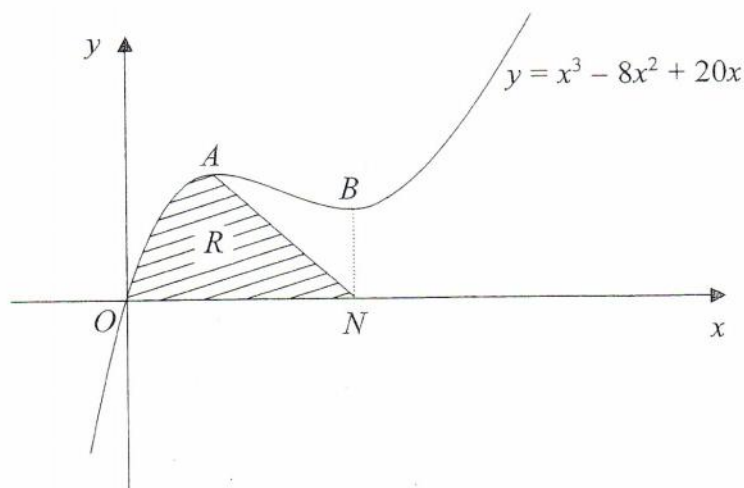


Figure 3 shows a sketch of part of the curve with equation $y = x^3 - 8x^2 + 20x$. The curve has stationary points A and B .

(a) Use calculus to find the x -coordinates of A and B . (4)

(b) Find the value of $\frac{d^2y}{dx^2}$ at A , and hence verify that A is a maximum. (2)

The line through B parallel to the y -axis meets the x -axis at the point N . The region R , shown shaded in Figure 3, is bounded by the curve, the x -axis and the line from A to N .

(c) Find $\int (x^3 - 8x^2 + 20x) dx$. (3)

(d) Hence calculate the exact area of R . (5)



9.

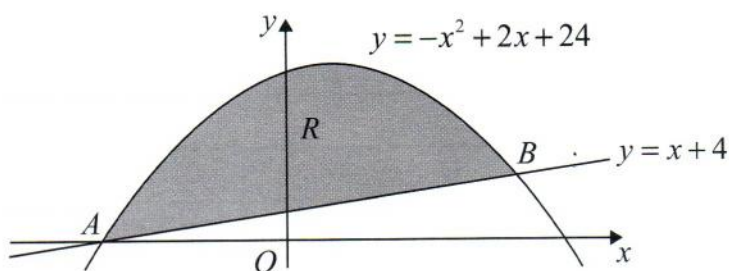


Figure 3

The straight line with equation $y = x + 4$ cuts the curve with equation $y = -x^2 + 2x + 24$ at the points A and B , as shown in Figure 3.

- (a) Use algebra to find the coordinates of the points A and B . (4)

The finite region R is bounded by the straight line and the curve and is shown shaded in Figure 3.

- (b) Use calculus to find the exact area of R . (7)

A Cartesian coordinate system with x and y axes. The origin is labeled O. A parabola, labeled $y = 10x - x^2 - 8$, opens downwards. A straight line, labeled $y = 10 - x$, has a negative slope. The region R is the shaded area bounded by the parabola above and the line below. The intersection points of the two curves are labeled A and B. Point A is the left intersection point, and point B is the right intersection point.

Figure 2 shows the line with equation $y = 10 - x$ and the curve with equation $y = 10x - x^2 - 8$

(a) Calculate the coordinates of A and the coordinates of B .

The shaded area R is bounded by the line and the curve, as shown in Figure 2.

(b) Calculate the exact area of R .

(7)

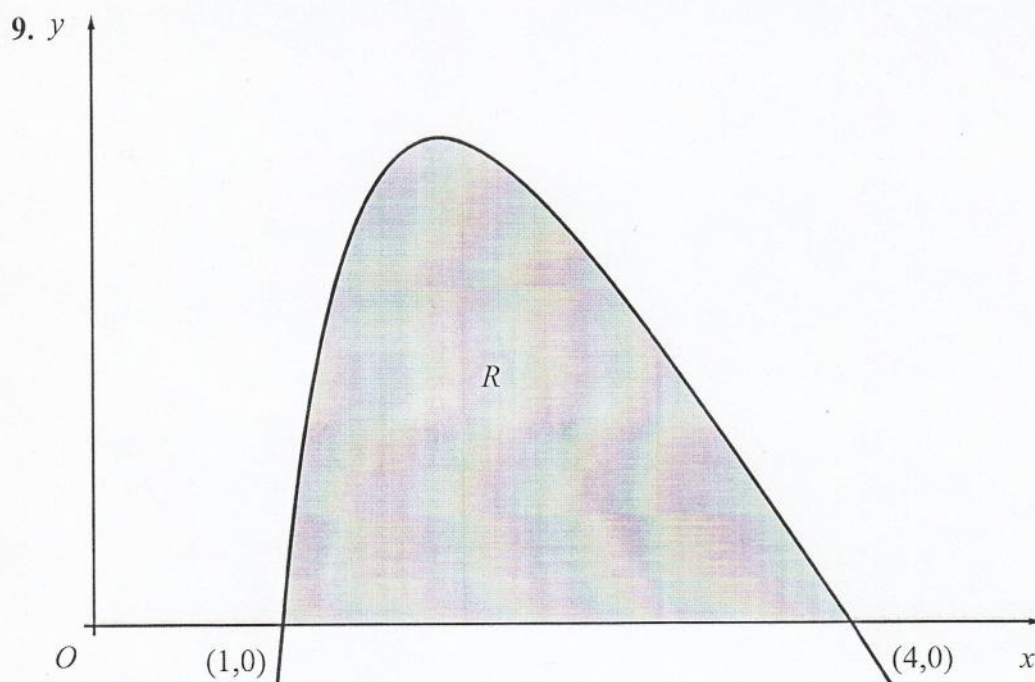


Figure 2

The finite region R , as shown in Figure 2, is bounded by the x -axis and the curve with equation

$$y = 27 - 2x - 9\sqrt{x} - \frac{16}{x^2}, \quad x > 0$$

The curve crosses the x -axis at the points $(1, 0)$ and $(4, 0)$.

(a) Complete the table below, by giving your values of y to 3 decimal places.

x	1	1.5	2	2.5	3	3.5	4
y	0	5.866		5.210		1.856	0

(2)

(b) Use the trapezium rule with all the values in the completed table to find an approximate value for the area of R , giving your answer to 2 decimal places.

(4)

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

(6)



A Cartesian coordinate system with a horizontal x-axis and a vertical y-axis. The origin is labeled O . A cubic curve, labeled C , is plotted. The curve passes through the origin O and intersects the x-axis at two other points, A and B . Point A is to the left of the origin, and point B is to the right of the origin. The region between the curve and the x-axis from A to O is shaded in light blue. The region between the curve and the x-axis from O to B is shaded in light red.

Figure 3

Figure 3 shows a sketch of part of the curve C with equation

$$y = x(x + 4)(x - 2)$$

The curve C crosses the x -axis at the origin O and at the points A and B .

- (a) Write down the x -coordinates of the points A and B .

(1)

The finite region, shown shaded in Figure 3, is bounded by the curve C and the x -axis.

- (b) Use integration to find the total area of the finite region shown shaded in Figure 3.

(7)

