

2.

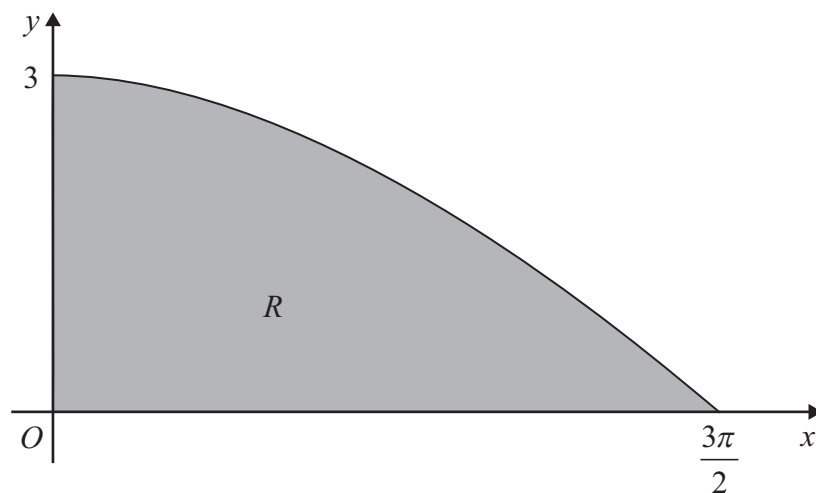


Figure 1

Figure 1 shows the finite region R bounded by the x -axis, the y -axis and the curve with equation $y = 3 \cos\left(\frac{x}{3}\right)$, $0 \leq x \leq \frac{3\pi}{2}$.

The table shows corresponding values of x and y for $y = 3 \cos\left(\frac{x}{3}\right)$.

x	0	$\frac{3\pi}{8}$	$\frac{3\pi}{4}$	$\frac{9\pi}{8}$	$\frac{3\pi}{2}$
y	3	2.77164	2.12132		0

- (a) Complete the table above giving the missing value of y to 5 decimal places. (1)
- (b) Using the trapezium rule, with all the values of y from the completed table, find an approximation for the area of R , giving your answer to 3 decimal places. (4)
- (c) Use integration to find the exact area of R . (3)



5.

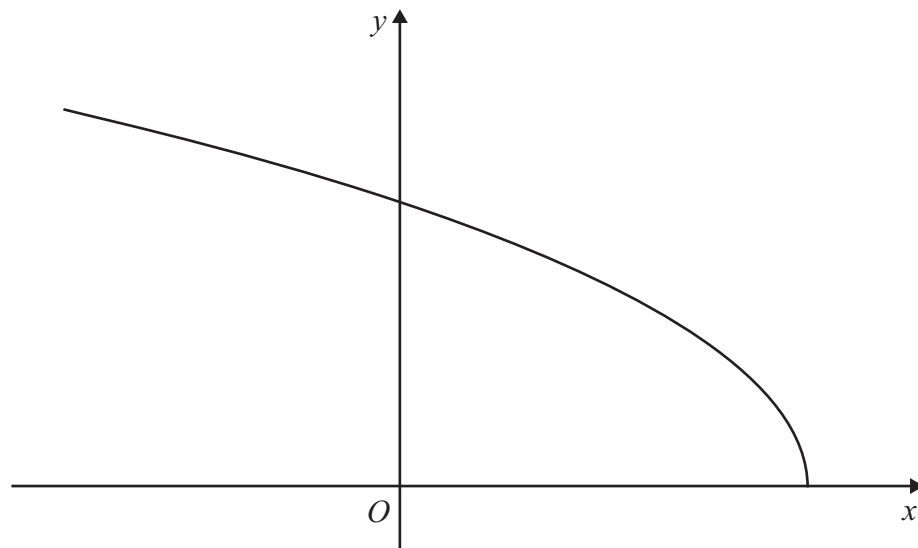


Figure 2

Figure 2 shows a sketch of the curve with parametric equations

$$x = 2 \cos 2t, \quad y = 6 \sin t, \quad 0 \leq t \leq \frac{\pi}{2}$$

(a) Find the gradient of the curve at the point where $t = \frac{\pi}{3}$. (4)

(b) Find a cartesian equation of the curve in the form

$$y = f(x), \quad -k \leq x \leq k,$$

stating the value of the constant k .

(4)

(c) Write down the range of $f(x)$.

(2)





Question 5 continued

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6. (a) Find $\int \sqrt{5-x} dx$.

(2)

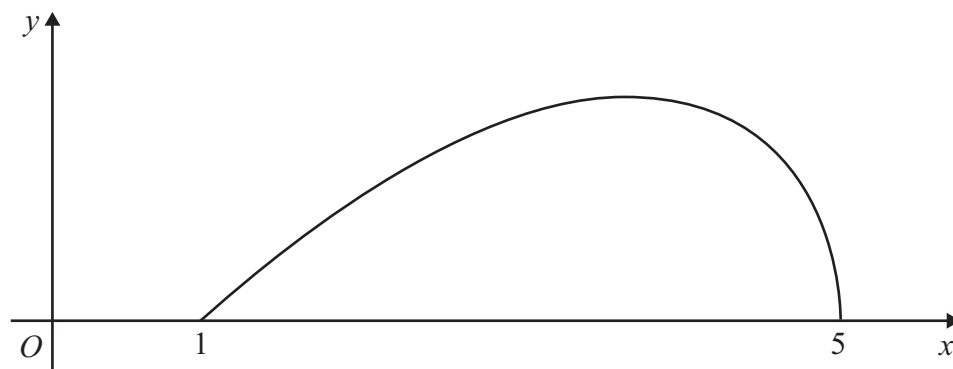


Figure 3

Figure 3 shows a sketch of the curve with equation

$$y = (x - 1) \sqrt{5 - x}, \quad 1 \leq x \leq 5$$

(b) (i) Using integration by parts, or otherwise, find

$$\int (x-1) \sqrt{5-x} dx$$

(4)

(ii) Hence find $\int_1^5 (x-1) \sqrt{5-x} dx$.

(2)



7. Relative to a fixed origin O , the point A has position vector $(8\mathbf{i} + 13\mathbf{j} - 2\mathbf{k})$, the point B has position vector $(10\mathbf{i} + 14\mathbf{j} - 4\mathbf{k})$, and the point C has position vector $(9\mathbf{i} + 9\mathbf{j} + 6\mathbf{k})$.

The line l passes through the points A and B .

- (a) Find a vector equation for the line l . (3)
- (b) Find $|\overrightarrow{CB}|$. (2)
- (c) Find the size of the acute angle between the line segment CB and the line l , giving your answer in degrees to 1 decimal place. (3)
- (d) Find the shortest distance from the point C to the line l . (3)
- The point X lies on l . Given that the vector \overrightarrow{CX} is perpendicular to l ,
- (e) find the area of the triangle CXB , giving your answer to 3 significant figures. (3)



