



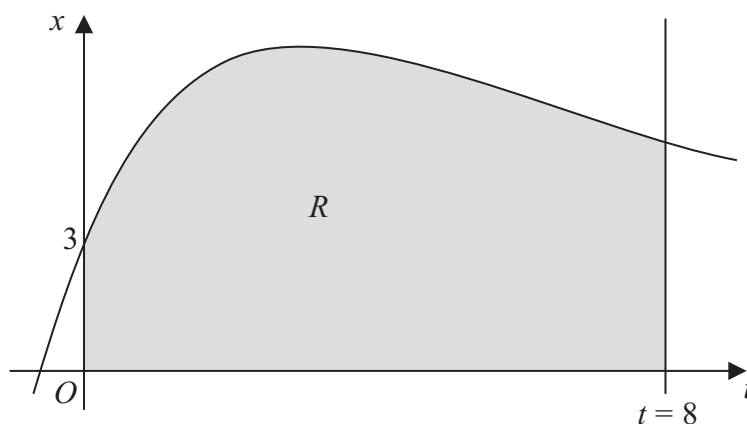


Figure 1

(a) Complete the table with the value of x corresponding to $t = 6$, giving your answer to 3 decimal places.

t	0	2	4	6	8
x	3	7.107	7.218		5.223

(1)

(3)

(6)

(1)





$$\mathbf{r} = \begin{pmatrix} a \\ b \\ 10 \end{pmatrix} + \lambda \begin{pmatrix} 6 \\ c \\ -1 \end{pmatrix}$$

Given that the point A lies on the line l ,

- (3)

(5)

- (2)

(2)



7.

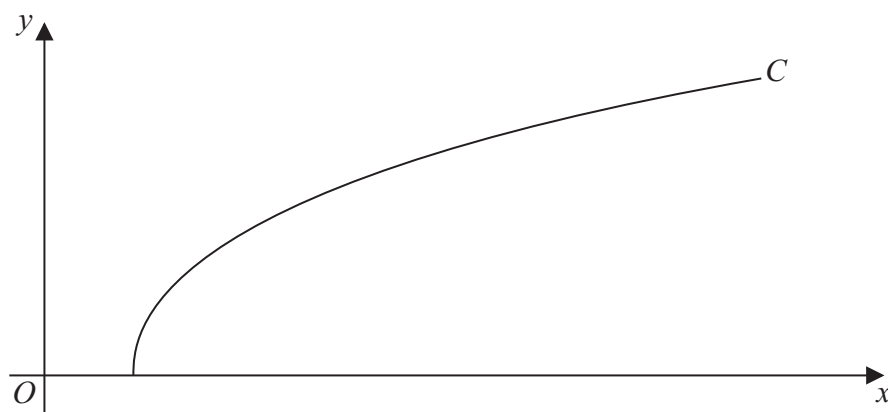


Figure 2

Figure 2 shows a sketch of the curve C with parametric equations

$$x = 27 \sec^3 t, \quad y = 3 \tan t, \quad 0 \leq t \leq \frac{\pi}{3}$$

- (a) Find the gradient of the curve C at the point where $t = \frac{\pi}{6}$ (4)

- (b) Show that the cartesian equation of C may be written in the form

$$y = (x^{\frac{2}{3}} - 9)^{\frac{1}{2}}, \quad a \leq x \leq b$$

stating the values of a and b .

(3)

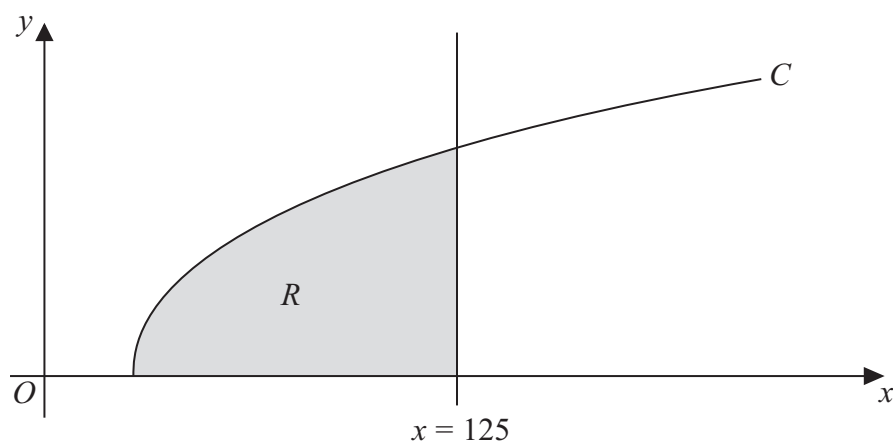


Figure 3

The finite region R which is bounded by the curve C , the x -axis and the line $x = 125$ is shown shaded in Figure 3. This region is rotated through 2π radians about the x -axis to form a solid of revolution.

- (c) Use calculus to find the exact value of the volume of the solid of revolution. (5)





The differential equation connecting x and t may be written in the form

$$\frac{dx}{dt} = k(M - x), \text{ where } M \text{ is a constant.}$$

- (a) Explain, in the context of the problem, what $\frac{dx}{dt}$ and M represent. (2)

(b) solve the differential equation, expressing x in terms of k , M and t . (6)

Given also that $x = \frac{1}{2}M$ when $t = \ln 4$,

- (c) find the value of x when $t = \ln 9$, expressing x in terms of M , in its simplest form. (4)

Question 8 continued

(Total 12 marks)

Q8

TOTAL FOR PAPER: 75 MARKS

END

