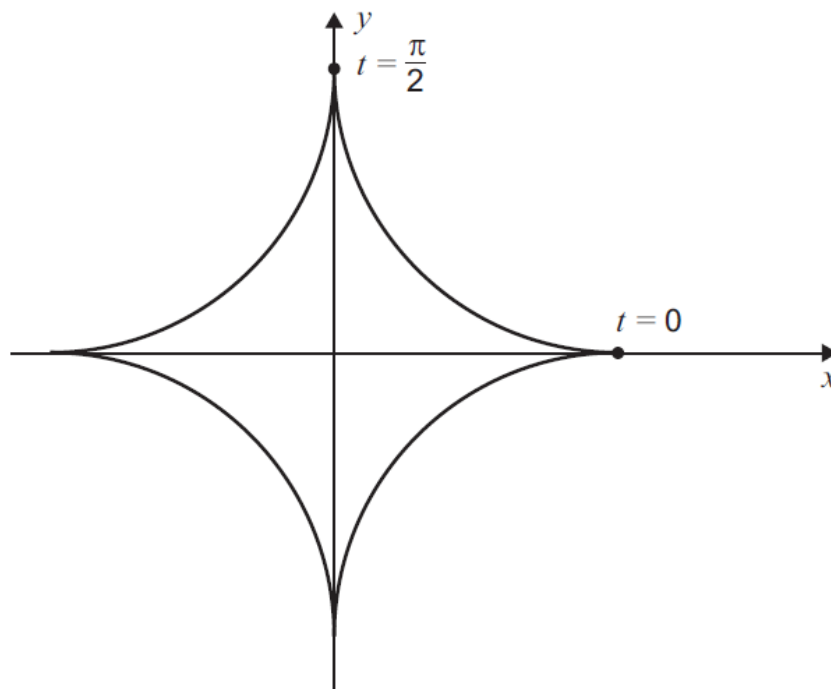


AQA – Further calculus – A2 Further Mathematics P2

1. June/2021/Paper_7367/2/No.7



The diagram shows a curve known as an astroid.

The curve has parametric equations

$$x = 4 \cos^3 t$$

$$y = 4 \sin^3 t$$

$$(0 \leq t < 2\pi)$$

The section of the curve from $t = 0$ to $t = \frac{\pi}{2}$ is rotated through 2π radians about the x -axis.

Show that the curved surface area of the shape formed is equal to $\frac{b\pi}{c}$, where b and c are integers.

[7 marks]

2. June/2021/Paper_7367/2/No.12

The integral S_n is defined by

$$S_n = \int_0^a x^n \sinh x \, dx \quad (n \geq 0)$$

(a) Show that for $n \geq 2$

$$S_n = n(n-1)S_{n-2} + a^n \cosh a - na^{n-1} \sinh a$$

[7 marks]

(b) Hence show that

$$\int_0^1 x^4 \sinh x \, dx = \frac{9}{2}e + \frac{65}{2}e^{-1} - 24$$

[5 marks]