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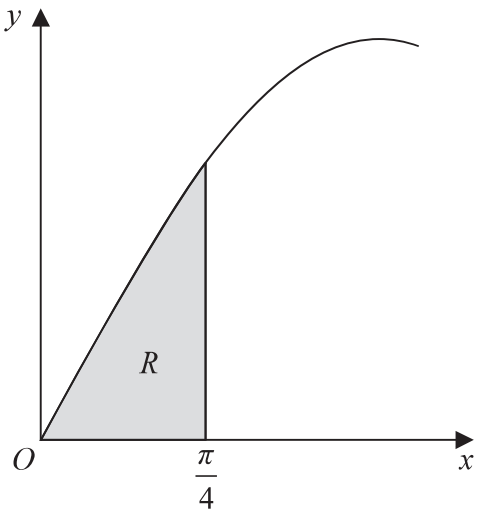


Figure 3

The region R, shown shaded in Figure 3, is bounded by part of the curve with equation $y = \sin x$, the line with equation $x = \frac{\pi}{4}$ and the x-axis. A uniform solid S is formed by rotating R through 2π radians about the x-axis.

(a) Use calculus to show that the volume of S is $\frac{\pi}{8}(\pi - 2)$.

(4)

(b) Use calculus to find, to 3 significant figures, the x coordinate of the centre of mass of S.

(8)

The point A lies on the circumference of the circular plane face of S. The solid S is freely suspended from A and hangs in equilibrium.

(c) Find, to the nearest degree, the size of the angle between OA and the vertical.

(4)

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Question 5 continued

Q5

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