

7.

Solutions based entirely on graphical or numerical methods are not acceptable.

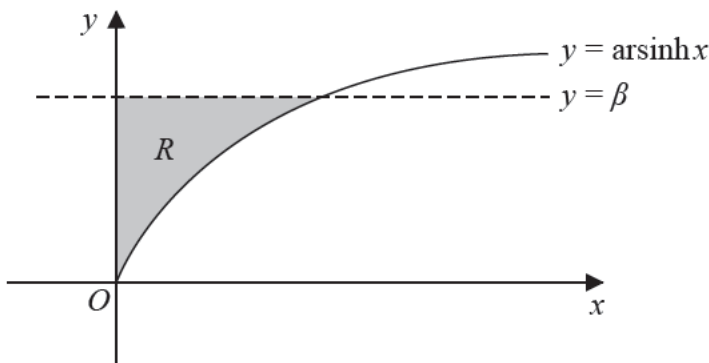


Figure 1

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

$$y = \operatorname{arsinh} x \quad x \geq 0$$

and the straight line with equation $y = \beta$

The line and the curve intersect at the point with coordinates (α, β)

Given that $\beta = \frac{1}{2} \ln 3$

(a) show that $\alpha = \frac{1}{\sqrt{3}}$

(3)

The finite region R , shown shaded in Figure 1, is bounded by the curve with equation $y = \operatorname{arsinh} x$, the y -axis and the line with equation $y = \beta$

The region R is rotated through 2π radians about the y -axis.

(b) Use calculus to find the exact value of the volume of the solid generated.

(6)