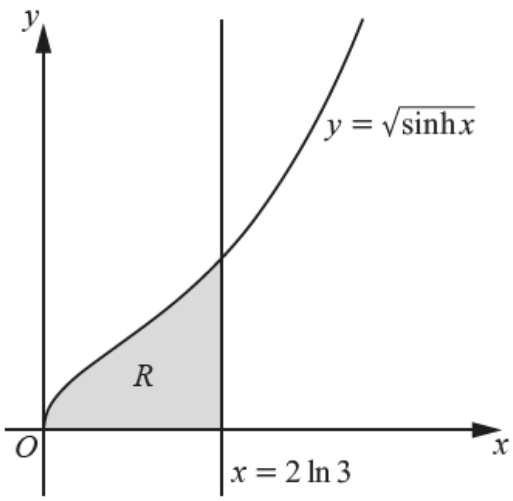
Further Calculus – 2022 GCE Pure Core 1 Further Math A Y540

1. June/2022/Paper_ Y540/01/No.1

In this question you must show detailed reasoning.

(a) Show that $\cosh(2\ln 3) = \frac{41}{9}$. **[2]**

The region R is bounded by the curve with equation $y = \sqrt{\sinh x}$, the x-axis and the line with equation $x = 2\ln 3$ (see diagram). The units of the axes are centimetres.



A manufacturer produces bell-shaped chocolate pieces. Each piece is modelled as being the shape of the solid formed by rotating R completely about the x-axis.

(b) Determine, according to the model, the exact volume of one chocolate piece. **[4]**

2. June/2022/Paper_ Y540/01/No.7

(a) Determine the values of A, B, C and D such that $\frac{x^2+18}{x^2(x^2+9)} \equiv \frac{A}{x} + \frac{B}{x^2} + \frac{Cx+D}{x^2+9}$. **[4]**

(b) In this question you must show detailed reasoning.

Hence determine the exact value of $\int_3^{\infty} \frac{x^2+18}{x^2(x^2+9)} \mathrm{d}x$. **[6]**