



QUESTION WORKBOOK

Volumes of revolution

Further calculus · Year FM

7 questions · 26 marks

PRINT EDITION

SECTION A · Warm-up

- A1** Write down the formula for the volume generated when the region under $y = f(x)$ between $x = a$ and $x = b$ is rotated fully about the x -axis, and state why the y is squared. [2]

- A2** The region under $y = 3$ from $x = 0$ to $x = 4$ is rotated about the x -axis. Find the volume by integration, and check it against a known solid. [3]

SECTION B · Standard

- B1** The region under $y = x^2$ from $x = 0$ to $x = 2$ is rotated fully about the x -axis. Find the exact volume. [4]

- B2** The region bounded by $y = x^3$, the y -axis and $y = 8$ is rotated about the y -axis. Find the exact volume. [4]

- B3** The region between $y = x$ and $y = x^2$ from $x = 0$ to $x = 1$ is rotated about the x -axis. Find the volume of the solid formed. [4]

- B4** Explain why rotating the region between two curves uses $\pi \int (\text{outer}^2 - \text{inner}^2) dx$ rather than $\pi \int (\text{outer} - \text{inner})^2 dx$. [3]

SECTION C · Stretch

- C1** A curve has parametric equations $x = t^2$, $y = 2t$ for $0 \leq t \leq 2$. The region bounded by the curve, the x-axis and the line $x = 4$ is rotated through 2π about the x-axis. Find the exact volume of the solid formed. [6]