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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]

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- 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  $2\pi$  about the x-axis. Find the exact volume of the solid formed. [6]