

C4 Volumes of Rotation Questions

Specimen

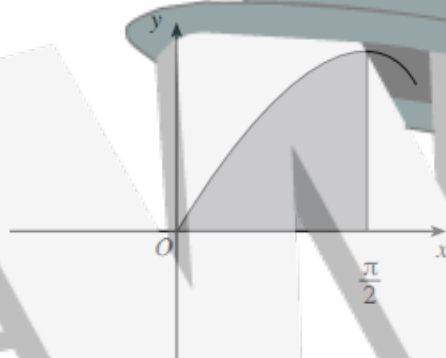
7. Find the volume of the solid generated when the portion of the curve  $y = \sqrt{x^3 \ln x}$  between  $x = 1$  and  $x = e$  is rotated about the  $x$ -axis. [6]

2005

5. The region bounded by the curve  $y = \sqrt{x} + \frac{4}{\sqrt{x}}$ , the  $x$ -axis and the lines  $x = 1$ ,  $x = 4$  is rotated through four right-angles about the  $x$ -axis. Find, correct to one decimal place, the volume of the solid formed. [5]

2006

5.



The diagram shows the shaded region bounded by the curve  $y = \sin x$ , the  $x$ -axis and the line  $x = \frac{\pi}{2}$ . The shaded region is rotated through four right-angles about the  $x$ -axis. Find the volume of the solid formed. [5]

2007

5. The region bounded by the curve  $y = \sqrt{e^{2x} + 1}$ , the  $x$ -axis and the lines  $x = 0$ ,  $x = 1$  is rotated through four right-angles about the  $x$ -axis. Find the volume of the solid generated, giving your answer correct to three decimal places. [4]

2008

4. The region  $R$  is bounded by the curve  $y = x + \frac{3}{\sqrt{x}}$ , the  $x$ -axis and the lines  $x = 1$ ,  $x = 4$ . Find the volume generated when  $R$  is rotated through four right-angles about the  $x$ -axis. [7]

2009

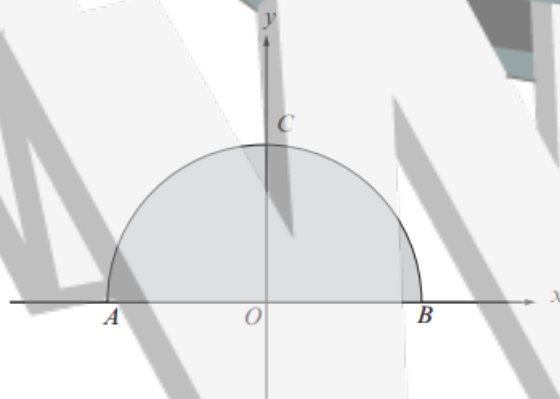
4. The region bounded by the curve  $y = \cos 2x$ , the  $x$ -axis and the lines  $x = 0$  and  $x = \frac{\pi}{8}$ , is rotated about the  $x$ -axis through four right-angles. Find the volume of the solid generated. [6]

2010

4. The region  $R$  is bounded by the curve  $y = \sin x$ , the  $x$ -axis and the lines  $x = \frac{\pi}{6}$ ,  $x = \frac{\pi}{3}$ . Find the volume generated when  $R$  is rotated through four right-angles about the  $x$ -axis. Give your answer correct to three decimal places. [5]

2011

5. The region shaded in the diagram below is bounded by the  $x$ -axis and that part of the curve with equation  $x^2 + y^2 = 9$  lying above the  $x$ -axis. The points of intersection of the curve with the coordinate axes are denoted by  $A$ ,  $B$  and  $C$ .



- (a) Write down the coordinates of  $A$ ,  $B$  and  $C$ . [1]
- (b) (i) By carrying out an appropriate integration, find the volume generated when the region shaded in the diagram is rotated through four right-angles about the  $x$ -axis. [4]
- (ii) Give a geometrical interpretation of your answer. [4]

2012

4. The region  $R$  is bounded by the curve  $y = \sqrt{x} + \frac{5}{\sqrt{x}}$ , the  $x$ -axis and the lines  $x = 3$ ,  $x = 4$ . Find the volume generated when  $R$  is rotated through four right-angles about the  $x$ -axis. Give your answer correct to the nearest integer. [5]

2013

4. The region  $R$  is bounded by the curve  $y = \sin 2x$ , the  $x$ -axis and the lines  $x = \frac{\pi}{6}$ ,  $x = \frac{\pi}{2}$ .  
Find the volume generated when  $R$  is rotated through four right angles about the  $x$ -axis. Give your answer correct to three decimal places. [5]

2014

4. The region  $R$  is bounded by the curve  $y = 3 + 2 \sin x$ , the  $x$ -axis and the lines  $x = 0$ ,  $x = \frac{\pi}{4}$ .  
Find the volume of the solid generated when  $R$  is rotated through four right angles about the  $x$ -axis. Give your answer correct to the nearest integer. [6]

2015

4. The line  $L$  has equation  $y = mx$ , where  $m > 0$ . The region  $R$  is bounded by  $L$ , the  $x$ -axis and the line  $x = a$ , where  $a > 0$ .
- (a) Using integration, find an expression, in terms of  $a$  and  $m$ , for the volume  $V$  generated when  $R$  is rotated through four right angles about the  $x$ -axis. [3]
- (b) The point with coordinates  $(a, b)$  lies on  $L$ .
- (i) Rewrite the expression for the volume  $V$  found in part (a) in terms of  $a$  and  $b$ .
- (ii) Give a geometrical interpretation of your answer. [3]

2016

9. The region  $R$  is bounded by the curve  $y = \cos x + \sin x$ , the  $x$ -axis and the lines  $x = \frac{\pi}{5}$ ,  $x = \frac{2\pi}{5}$ . Find the volume of the solid generated when  $R$  is rotated through four right angles about the  $x$ -axis. Give your answer correct to two decimal places. [6]

2017

4. The region  $R$  is bounded by the curve  $y = \cos x + \sec x$ , the  $x$ -axis and the lines  $x = \frac{\pi}{6}$ ,  $x = \frac{\pi}{3}$ . Find the volume of the solid generated when  $R$  is rotated through four right angles about the  $x$ -axis. Give your answer correct to two decimal places. [7]