C4 Volumes Of Revolution

1. The curve $y = 2\sqrt{x}$ is rotated about the x-axis through 360° between $x = 0$ and $x = 3$. Find the volume generated. $\boxed{18\pi}$

2. The area under the curve $y = (2x - 1)^3$ between $x = \frac{1}{2}$ and $x = 2$ is rotated through 360° about the x-axis. Find the volume of revolution. □

3. Sketch the graph $y = e^x + 1$. The area under the curve between $x = 0$ and $x = \ln 2$ is rotated about the x-axis through 360°. Calculate the volume generated. □

4. Sketch the graph of $y = x^2 + 1$. Show that the area between the curve and the y-axis between $y = 1$ and $y = 3$ is given by

$$\int_1^3 \sqrt{y-1}\, dy$$

and calculate it. □

If this area is rotated about the y-axis through 360°, calculate the volume generated. □

5. The curve $y = \ln x$ is rotated about the y-axis through 360° between $y = 0$ and $y = 2$. Find the volume of revolution. □

6. Sketch the graphs of $y = 3x$ and $y = x^2$. Find the area between the line $y = 3x$ and curve $y = x^2$. □

Find the volume of revolution if the area is rotated through 360° about the

(a) x-axis, □

(b) y-axis. □

7. Sketch on the same diagram $y = 3 - e^x$ and $y = 2e^{-x}$. If the finite area enclosed between them is rotated through 360° about the x-axis, find the volume generated. □

8. A cylindrical hole is drilled through a sphere, with the axis of the cylinder passing through the centre of the sphere. The length of the hole is $2a$. Use calculus to prove that the volume of the part of the sphere that remains does not depend on the radius of the sphere. □