

Chapter 5

Further A-Level Pure Mathematics : Core 1 Volumes of Revolution

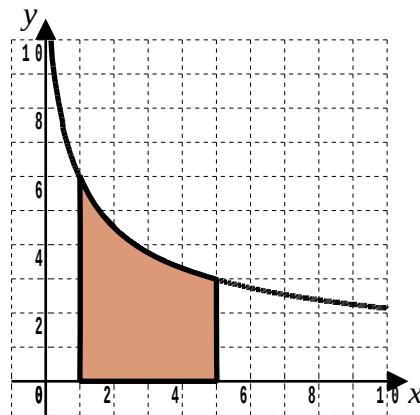
5.1 Test

*Any solution based entirely on graphical
or numerical methods is not acceptable*

Marks Available : 40

Question 1

The graph is of the function, $f(x) = \frac{12}{\sqrt{3x+1}}$, $x \in \mathbb{R}, x > -\frac{1}{3}$



- (i) Find the area shown shaded in the graph.

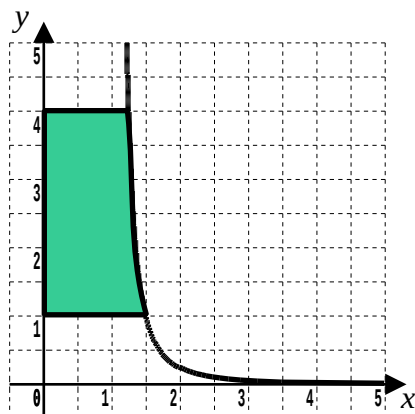
[3 marks]

- (ii) The shaded area is now spun 360° about the x -axis.
Show that the volume of the solid formed is $96\pi \ln 2$

[6 marks]

Question 2

The graph is of the function, $f(y) = 1 + \frac{1}{2\sqrt{y}}$, $y \in \mathbb{R}, y \neq 0$

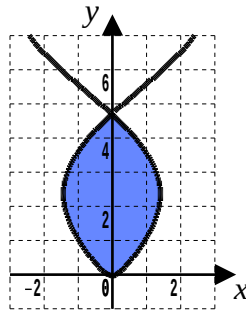


The shaded region bounded by the curve, the y -axis and the lines $y = 1$ and $y = 4$, is rotated through 360° about the y -axis. Using integration, show that the volume of the solid generated is $\pi \left(5 + \frac{1}{2} \ln 2 \right)$

[9 marks]

Question 3

The curve shown in the diagram has equation $2x^2 = y \sin y + y$



- (i) Show that the coordinates of the positive y -axis crossing are $\left(0, \frac{3\pi}{2} \right)$

[1 mark]

The shaded region is rotated about the y -axis to generate a solid of revolution.

- (ii) Find the exact volume of the solid generated.

[8 marks]

Question 4

Find the exact volume of the solid generated when the curve $y = \frac{2\sqrt{2}}{\sqrt{x}(5x-2)}$

between $x = \frac{1}{2}$ and $x = 1$ is rotated 2π radians about the x -axis.

Simplify your answer.

[13 marks]

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Teachers may obtain detailed worked solutions to the exercises by email from mhh@shrewsbury.org.uk