Volumes of revolution

AS Core Pure Mathematics | Edexcel 8FM0 | 12 questions, 74 marks

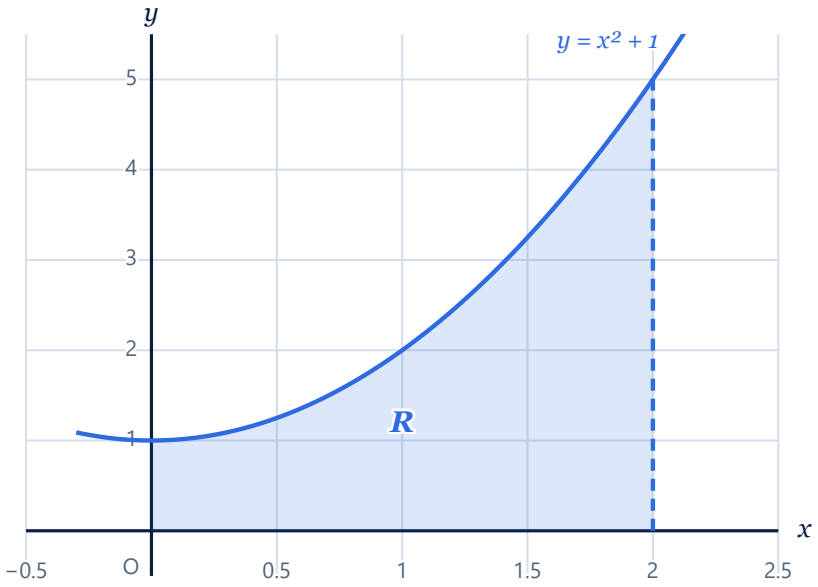
Further Maths topic practice

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Name: _____ **Date:** _____ **Score:** _____ **/ 74**

1 The diagram shows the region R bounded by the curve with equation $y = x^2 + 1$, the x-axis, the y-axis and the line $x = 2$

The region R is rotated through 2π radians about the x-axis. Use calculus to find the exact volume of the solid generated.



(4 marks)

Answer _____

2 The region bounded by the curve with equation $y = 2\sqrt{x}$, the x-axis and the lines $x = 1$ and $x = 4$ is rotated through 360° about the x-axis.

Find the exact volume of the solid formed.

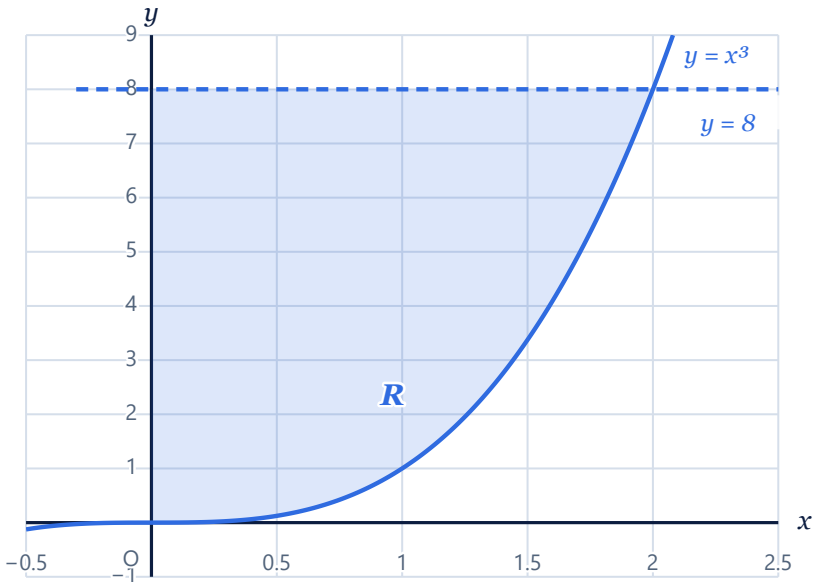
(3 marks)

Answer _____

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3 The diagram shows the region R bounded by the curve with equation $y = x^3$, the y-axis and the line $y = 8$

The region R is rotated through 2π radians about the y-axis. Find the exact volume of the solid generated.



(5 marks)

Answer _____

4 The curve C has equation $y = \frac{3}{x}$, $x > 0$

The region bounded by C, the x-axis and the lines $x = 1$ and $x = 3$ is rotated through 360° about the x-axis.

Find the volume of the solid formed, giving your answer as an exact multiple of π

(4 marks)

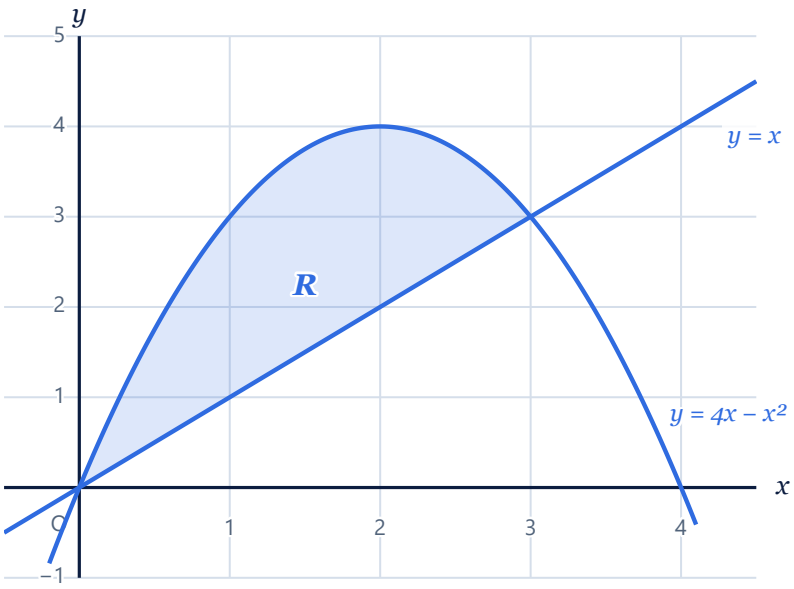
Answer _____

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5 The diagram shows the curve with equation $y = 4x - x^2$ and the line with equation $y = x$. The finite region R lies between the curve and the line.

a. Find the x-coordinates of the points where the line meets the curve.

b. The region R is rotated through 2π radians about the x-axis. Find the exact volume of the solid generated.



(6 marks)

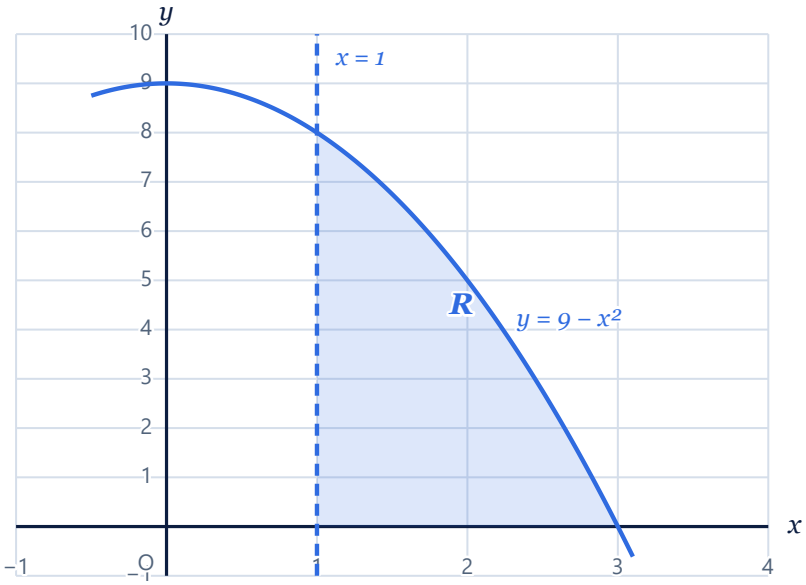
Answer _____

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6 The diagram shows the region R bounded by the curve with equation $y = 9 - x^2$, the x-axis and the line $x = 1$

The region R is rotated through 360° about the y-axis to form a solid ring.

Find the exact volume of the ring.



(6 marks)

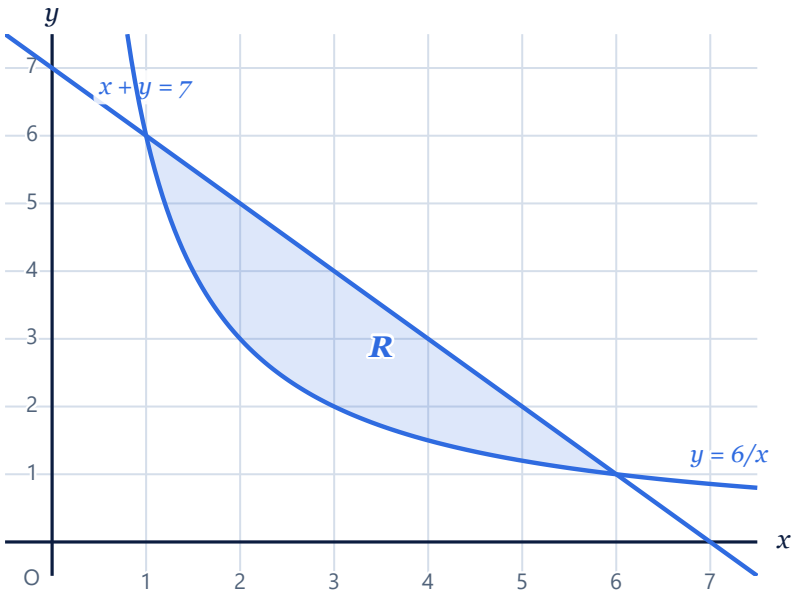
Answer

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7 The diagram shows the curve with equation $y = \frac{6}{x}$, $x > 0$, and the line with equation $x + y = 7$

a. Find the x-coordinates of the points where the line meets the curve.

b. The finite region R between the line and the curve is rotated through 2π radians about the x-axis. Use algebraic integration to find the exact volume of the solid generated.



(7 marks)

Answer

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8 The region R is bounded by the curve with equation $y = \sqrt{x}$, the x-axis and the line $x = 4$

a. Find the exact volume of the solid formed when R is rotated through 2π radians about the x-axis.

b. Find the exact volume of the solid formed when R is rotated through 2π radians about the y-axis.

(7 marks)

Answer

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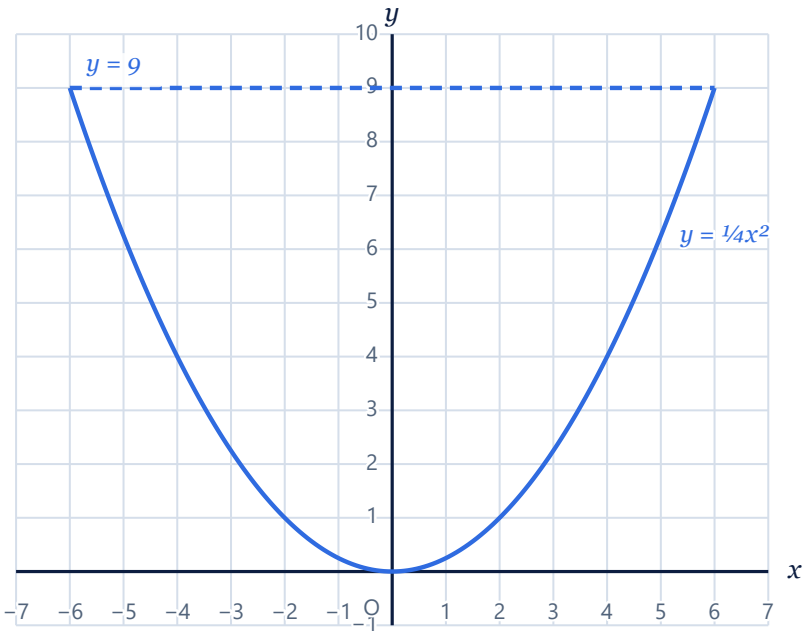
9 The inside of a bowl is modelled by rotating the curve with equation $y = \frac{1}{4}x^2$, for $0 \leq y \leq 9$, through 360° about the y-axis. The units are centimetres and the y-axis is vertical.

a. Show that, according to the model, the volume of water in the bowl when the water has depth h cm is $2\pi h^2$ cm^3

b. Find the volume of water the bowl holds when it is full.

c. Kofi pours 200 cm^3 of soup into the bowl. Find the depth of the soup.

d. Give one reason why the model may not give the true capacity of the bowl.



(7 marks)

Answer _____

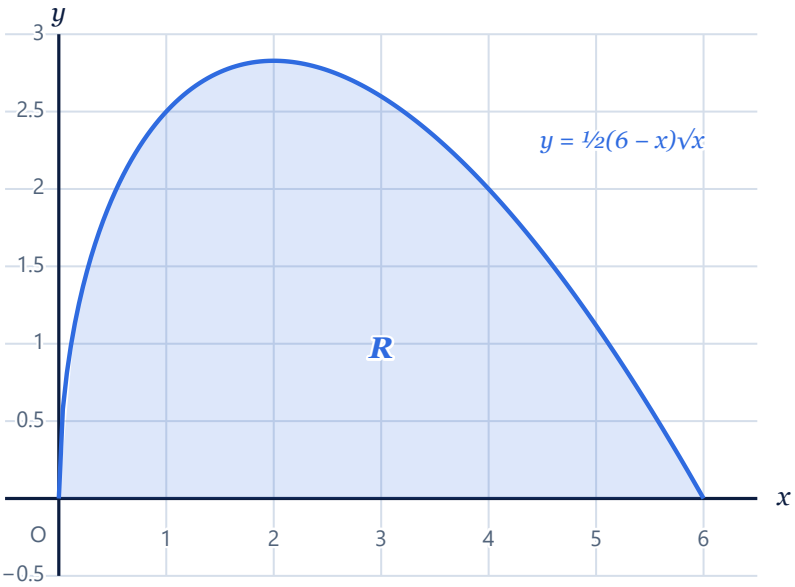
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10 A wooden door knob is modelled by rotating the region R, bounded by the curve with equation $y = \frac{1}{2}(6 - x)\sqrt{x}$ and the x-axis, through 2π radians about the x-axis. The units are centimetres.

a. Use algebraic integration to show that the volume of the knob, according to the model, is 27π cm^3

b. The wood has a density of 0.7 grams per cm^3. Find the mass of the knob according to the model.

c. A knob made this way has a mass of 62 g. Comment on the model.



(7 marks)

Answer

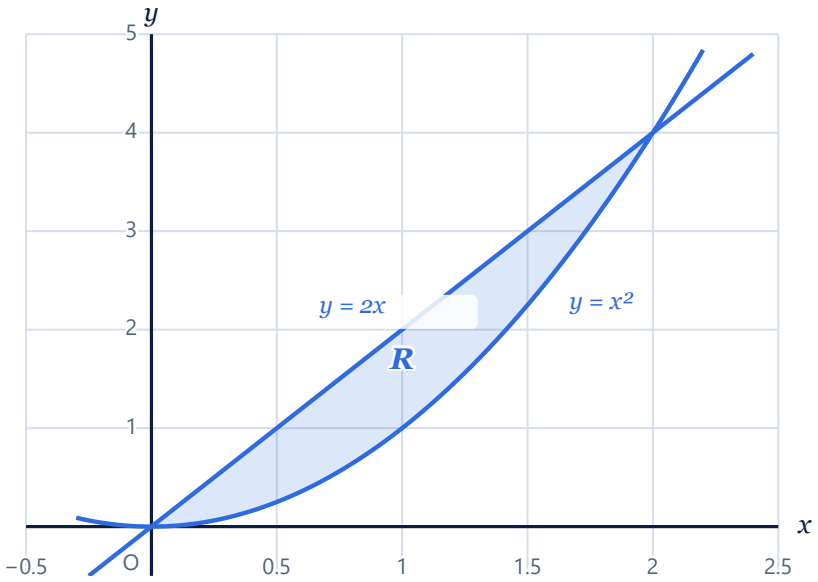
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11 The diagram shows the finite region R bounded by the curve with equation $y = x^2$ and the line with equation $y = 2x$

a. Find the coordinates of the points where the line meets the curve.

b. Find the exact volume of the solid formed when R is rotated through 2π radians about the x-axis.

c. Find the exact volume of the solid formed when R is rotated through 2π radians about the y-axis.



(9 marks)

Answer

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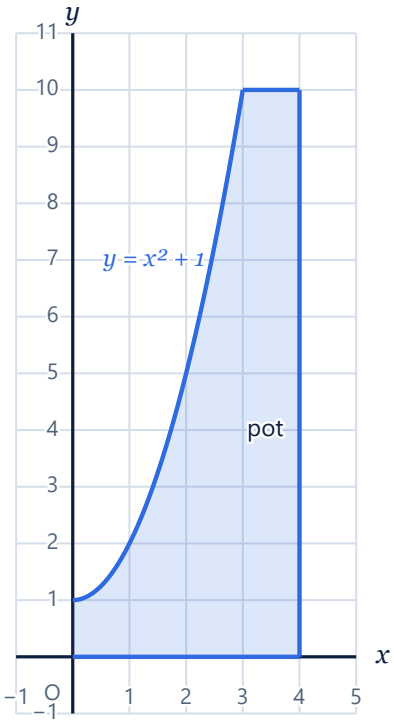
12 A ceramic plant pot is modelled as a solid cylinder of radius 4 cm and height 10 cm with its inside removed. The inside surface is modelled by rotating the curve with equation $y = x^2 + 1$, for $1 \leq y \leq 10$, through 360° about the y-axis. The base of the pot lies on $y = 0$, and the diagram shows the right-hand half of a vertical cross-section through the centre.

a. Show that the volume of the inside of the pot is $\frac{81}{2}\pi$ cm^3

b. Find the exact volume of ceramic in the pot.

c. The ceramic has a density of 2.3 g per cm^3. Find the mass of the pot.

d. The pot is filled with compost to 2 cm below the rim. Find the volume of compost needed.



(9 marks)

Answer

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End of questions | Total 74 marks

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