

Areas & Volumes

Question Paper 9

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Integration
Sub Topic	Areas & Volumes
Booklet	Question Paper 9

Time Allowed: 62 minutes

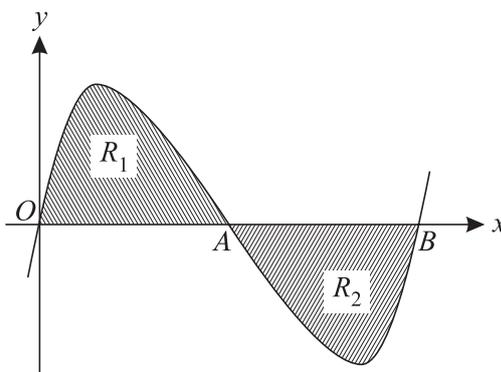
Score: /51

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1



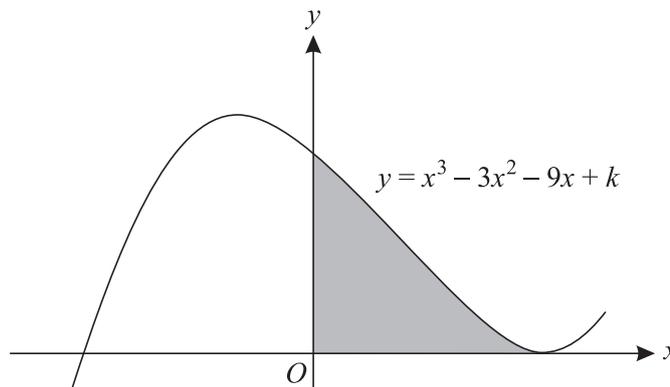
The diagram shows the curve $y = x(x - 1)(x - 2)$, which crosses the x -axis at the points $O (0, 0)$, $A (1, 0)$ and $B (2, 0)$.

- (i) The tangents to the curve at the points A and B meet at the point C . Find the x -coordinate of C . [5]
- (ii) Show by integration that the area of the shaded region R_1 is the same as the area of the shaded region R_2 . [4]

2 The equation of a curve is $y = \frac{6}{5 - 2x}$.

- (i) Calculate the gradient of the curve at the point where $x = 1$. [3]
- (ii) A point with coordinates (x, y) moves along the curve in such a way that the rate of increase of y has a constant value of 0.02 units per second. Find the rate of increase of x when $x = 1$. [2]
- (iii) The region between the curve, the x -axis and the lines $x = 0$ and $x = 1$ is rotated through 360° about the x -axis. Show that the volume obtained is $\frac{12}{5}\pi$. [5]

3



The diagram shows the curve $y = x^3 - 3x^2 - 9x + k$, where k is a constant. The curve has a minimum point on the x -axis.

- (i) Find the value of k . [4]
- (ii) Find the coordinates of the maximum point of the curve. [1]
- (iii) State the set of values of x for which $x^3 - 3x^2 - 9x + k$ is a decreasing function of x . [1]
- (iv) Find the area of the shaded region. [4]

4 A curve is such that $\frac{dy}{dx} = \frac{16}{x^3}$, and $(1, 4)$ is a point on the curve.

- (i) Find the equation of the curve. [4]
- (ii) A line with gradient $-\frac{1}{2}$ is a normal to the curve. Find the equation of this normal, giving your answer in the form $ax + by = c$. [4]
- (iii) Find the area of the region enclosed by the curve, the x -axis and the lines $x = 1$ and $x = 2$. [4]

5 A curve has equation $y = \frac{4}{\sqrt{x}}$.

- (i) The normal to the curve at the point $(4, 2)$ meets the x -axis at P and the y -axis at Q . Find the length of PQ , correct to 3 significant figures. [6]
- (ii) Find the area of the region enclosed by the curve, the x -axis and the lines $x = 1$ and $x = 4$. [4]