

Lesson 8

A-Level Pure Mathematics, Year 1 Additional Mathematics **Integration I**

8.1 TEST

*Any solution based entirely on graphical
or numerical methods is not acceptable*
Marks Available : 66

Question 1

Show that the following integral has an exact value of 100

$$\int_1^3 12x^2 - 2 \, dx$$

[4 marks]

Question 2

Find this indefinite integral, giving your answer in a simplified form.

$$\int \frac{9x^5}{2} \, dx$$

[3 marks]

Question 3

A-Level Examination Question from May 2010, Paper C1, Q2 (Edexcel)

Find

$$\int \left(8x^3 + 6x^{\frac{1}{2}} - 5 \right) dx$$

giving each term in its simplest form

[4 marks]

Question 4

A-Level Examination Question from June 2009, Paper C1, Q3 (Edexcel)

Given that

$$y = 2x^3 + \frac{3}{x^2}, \quad x \neq 0$$

Find (a) $\frac{dy}{dx}$

[3 marks]

(b) $\int y \, dx$
simplifying each term

[3 marks]

Question 5

Additional Mathematics Examination Question from June 2006, Q6 (OCR)

A curve has gradient given by

$$\frac{dy}{dx} = 2x + 2$$

The curve passes through the point (3, 0)

Find the equation of the curve.

[5 marks]

Question 6

A-Level Examination Question from May 2006, Paper C2, Q2 (Edexcel)

Use calculus to find the exact value of

$$\int_1^2 \left(3x^2 + 5 + \frac{4}{x^2} \right) dx$$

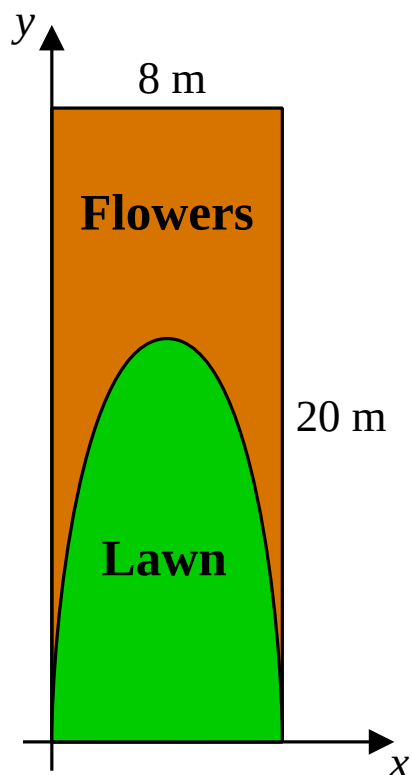
[5 marks]

Question 7

Additional Mathematics Examination Question from June 2013, Q8 (OCR)

A mathematical gardener has a garden which is rectangular in shape measuring 20 metres by 8 metres. He wishes to arrange the garden so that approximately half of it is lawn and the rest flower bed. He sets up a coordinate system as shown in the diagram below and maps out the graph of the curve,

$$y = 8x - x^2$$

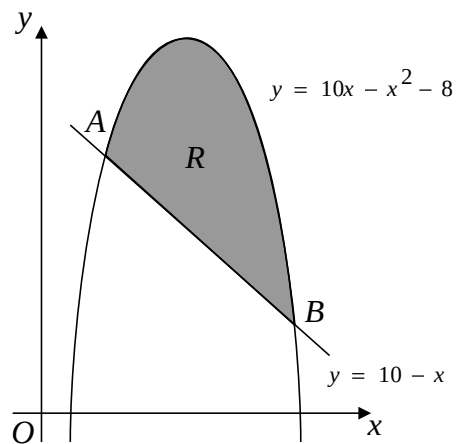


Show that the area of the lawn is approximately 53% of the total area.

[6 marks]

Question 8

A-Level Examination Question from May 2012, Paper C2, Q5 (Edexcel)



The diagram shows the line with equation $y = 10 - x$ and the curve with equation $y = 10x - x^2 - 8$

The line and the curve intersect at the points A and B, and O is the origin.

(a) Calculate the coordinates of A and the coordinates of B.

[5 marks]

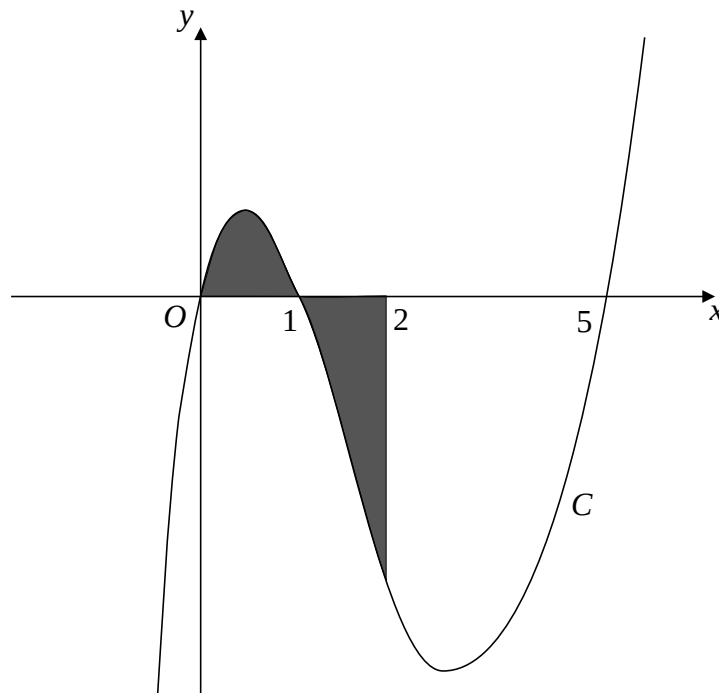
The shaded area R is bounded by the line and the curve as shown.

(b) Calculate the exact area of R.

[7 marks]

Question 9

A-Level Examination Question from January 2007, Paper C2, Q7 (Edexcel)



The sketch shows part of the curve C with equation

$$y = x(x - 1)(x - 5)$$

Use calculus to find the total area of the finite region, shown shaded, that is between $x = 0$ and $x = 2$ and is bounded by C , the x -axis and the line $x = 2$.

[9 marks]

Question 10

Additional Mathematics Examination Question from June 2008, Q10 (OCR)

Simon and Gavin drive a distance of 140 km along a motorway, both at constant speed. Simon drives at 5 km per hour faster than Gavin.

Let Gavin's speed be v km per hour.

- (i) Write down expressions in terms of v for the times, in hours, taken by Gavin and Simon.

[2 marks]

Simon completes the journey in 15 minutes less than Gavin.

- (ii) Explain why

$$\frac{140}{v} - \frac{140}{v + 5} = \frac{1}{4}$$

and show that this equation reduces to the equation

$$v^2 + 5v - 2800 = 0$$

[5 marks]

- (iii) Solve this equation to find v and hence find the times taken by Simon and Gavin. Give your answers correct to the nearest minute.

[5 marks]

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Teachers may obtain detailed worked solutions to the exercises by email from MHHShrewsbury@Gmail.com