

8.1 Integration

Question Paper

Course	Edexcel IAL Maths: Pure 2
Section	8. Integration
Topic	8.1 Integration
Difficulty	Medium

Time allowed: 70

Score: /60

Percentage: /100

Question 1

Evaluate

$$\int_1^5 (4x + 6x^2) \, dx$$

[2 marks]**Question 2**

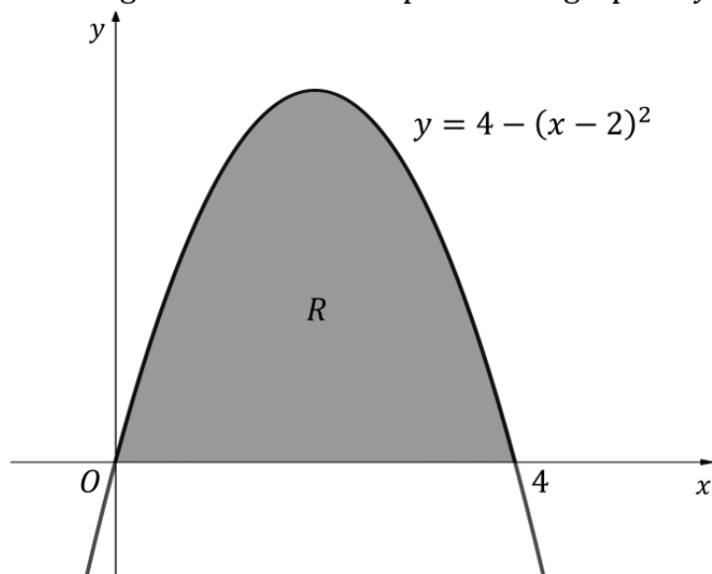
Given

$$\int_k^5 (2x - 1) \, dx = 20$$

find the value of the positive constant k .**[4 marks]**

Question 3

The diagram below shows part of the graph of $y = 4 - (x - 2)^2$.



(a) Write down the values of x where $y = 0$.

[1 mark]

Question 3

(b) Show that

$$4 - (x - 2)^2 = 4x - x^2$$

[1 mark]

Question 3

(c) Evaluate

$$\int_0^4 (4x - x^2) dx$$

[2 marks]

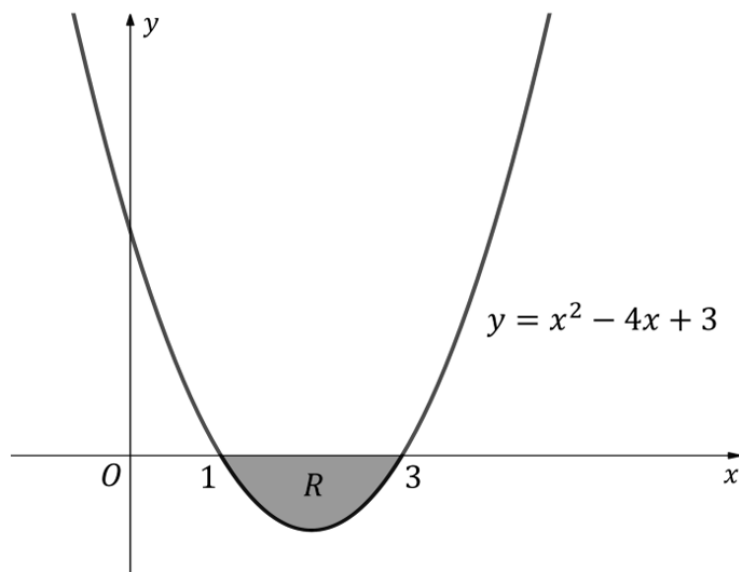
Question 3

(d) Write down the area of the region labelled R .

[1 mark]

Question 4

The diagram below shows part of the graph of $y = x^2 - 4x + 3$.
Find the area of the shaded region labelled R .



[3 marks]

Question 5

- (a) Find the x -coordinates of the intercepts of the line with equation $y = 2$ and the curve with equation $y = x^2 - 4x + 5$.

[2 marks]**Question 5**

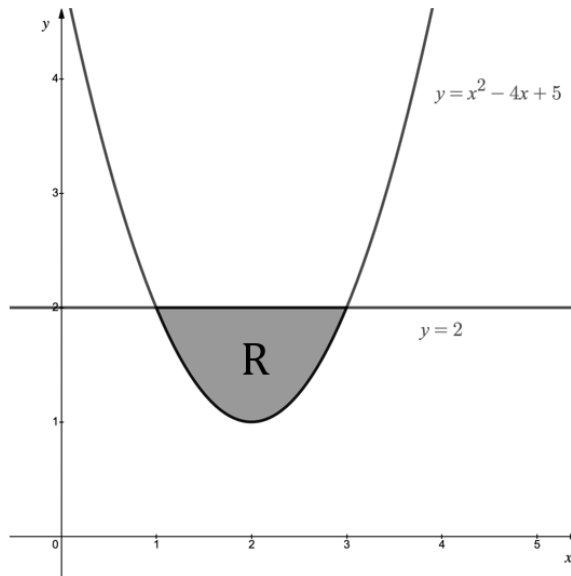
- (b) Evaluate

$$\int_1^3 (x^2 - 4x + 5) dx$$

[2 marks]

Question 5

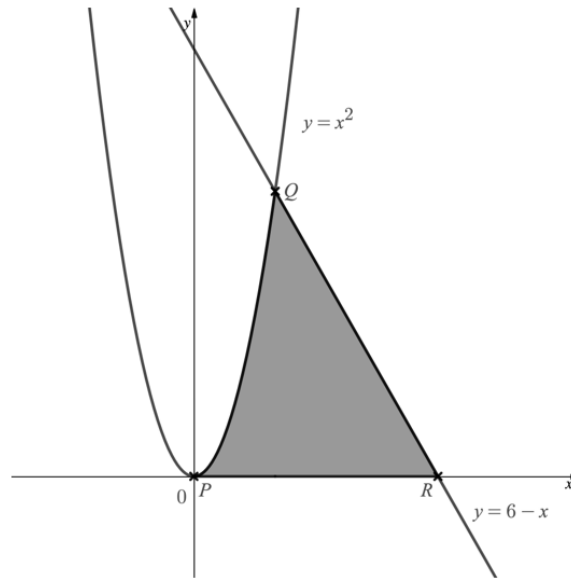
- (c) The diagram below shows the graphs of $y = 2$ and $y = x^2 - 4x + 5$.
Find the exact area of the shaded region R .



[4 marks]

Question 6

The diagram below shows the graphs of the line $y = 6 - x$ and the curve $y = x^2$.



(a) Work out the x -coordinates of the points labelled P , Q and R .

[2 marks]

Question 6

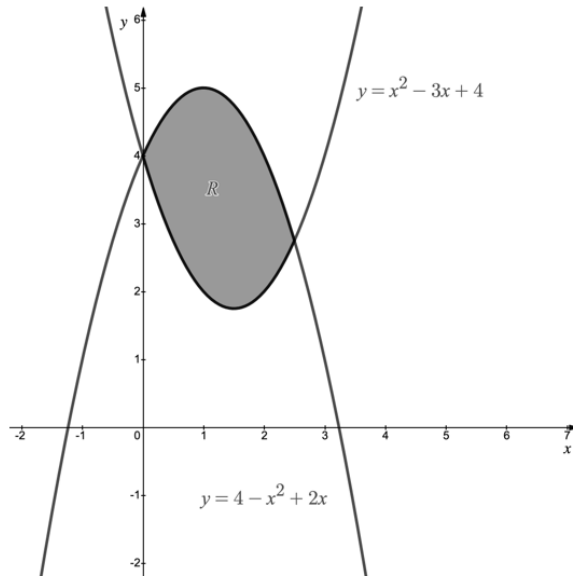
(b) Work out the area of the shaded region.

[4 marks]

Question 7

The diagram below shows a sketch of the curves with equations

$$y = x^2 - 3x + 4 \quad \text{and} \quad y = 4 - x^2 + 2x$$



(a) Find the x -coordinates of the intersections of the two graphs.

[2 marks]

Question 7

(b) Show that the area of the shaded region labelled R is given by

$$\int_0^{\frac{5}{2}} (5x - 2x^2) dx$$

[2 marks]

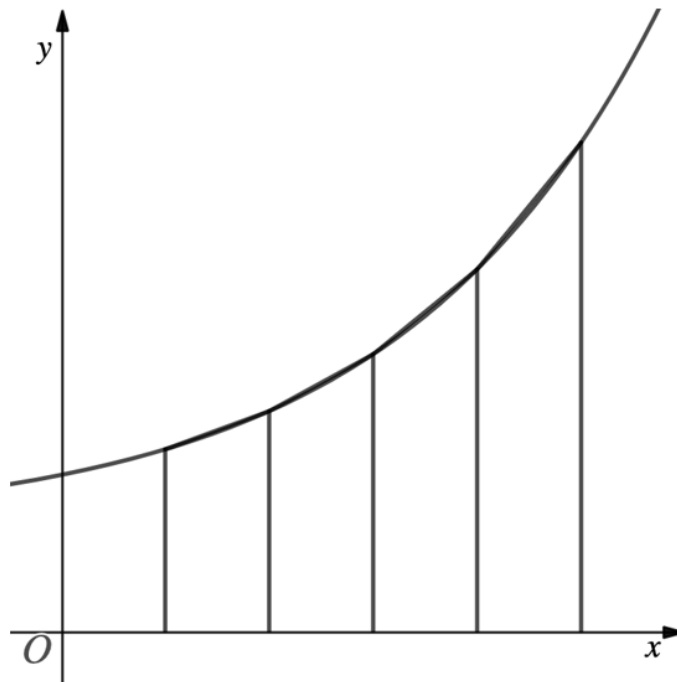
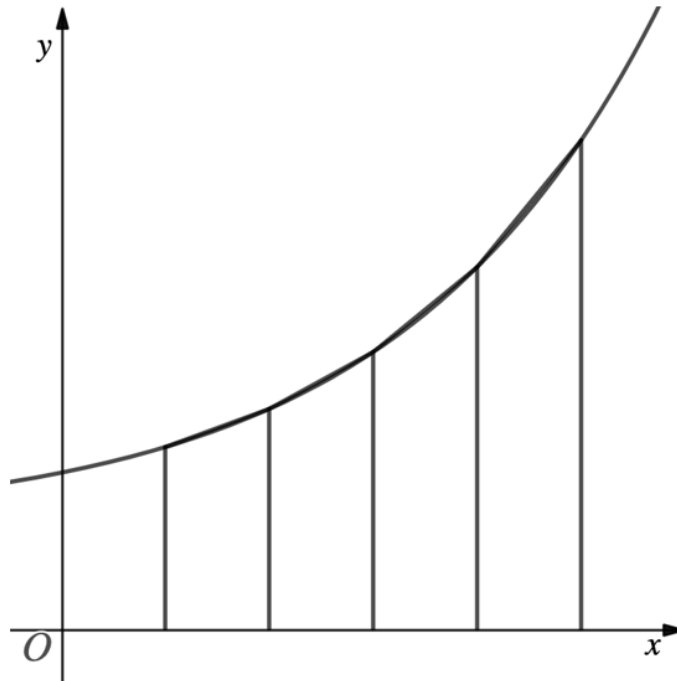
Question 7

(c) Use calculus to find the area of the shaded region labelled R .

[5 marks]

Question 8

Use the two diagrams below to show how rectangles can be used to give an upper and lower bound when estimating the area under a curve using the trapezium rule.

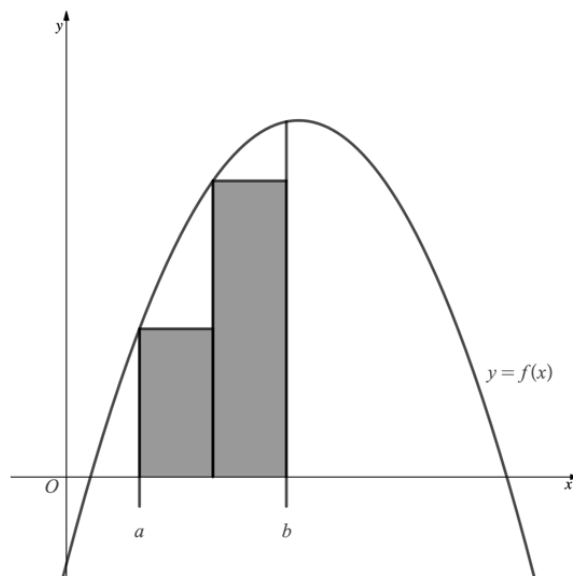


[3 marks]

Question 9

A student is estimating the area bounded by the curve $y = f(x)$, the x -axis and the lines $x = a$ and $x = b$.

The student intends to find the area of two rectangles of equal width in order to estimate the area as shown in the diagram below.

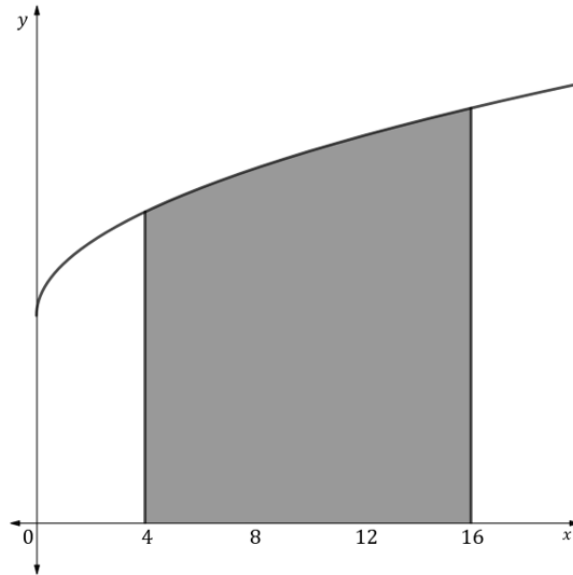


By drawing a sketch, show how the student's estimate of the area can be improved while still using rectangles of equal width.

[2 marks]

Question 10

The diagram below shows the graph with equation $y = \sqrt{x} + 4$.



The shaded area is to be estimated using the trapezium rule where $h = 2$.

- (a) (i) Write down the number of strips to be used.
- (ii) Write down the number of ordinates to be used.
- (iii) Complete the table of values for $y = \sqrt{x} + 4$, giving values to three significant figures where appropriate.

x	4						
y							

[4 marks]

Question 10

(b) Use the trapezium rule with all the values from the table above to find an estimate of the integral

$$\int_4^{16} (\sqrt{x} + 4) dx$$

giving your answer to three significant figures.

[4 marks]**Question 10**

(c) State, with a reason, whether your answer to part (b) is an overestimate or an underestimate.

[2 marks]

Question 11

The trapezium rule is to be used to estimate the integral

$$\int_{-2}^0 x^3 + 8 \, dx$$

(a) By completing the table of values below, use the trapezium rule to estimate the integral given above.

x	-2	-1.5	-1	-0.5	0
$y = x^3 + 8$					

[5 marks]

Question 11

- (b) i) By finding the exact value of the integral above, find the percentage error of your estimate from part (a).
- ii) Explain how you could increase the accuracy of your trapezium rule estimate.

[3 marks]