

1 $y = 2x^3 + 5x^2 - 7x + 10$
Find $\int y \, dx$

(Total for question 1 is 4 marks)

2 Find $\int (3x^2 + 7x - 2) \, dx$

(Total for question 2 is 4 marks)

3 Find $\int (x + 4)(x - 3) dx$

(Total for question 3 is 4 marks)

4 $f'(x) = 6x^2 - 3x + 8$

Given that the point (1, 8) lies on $y = f(x)$

Find an expression for $f(x)$

(Total for question 4 is 5 marks)

5 $y = 4\sqrt{x} + \frac{1}{x^2} + 10$
Find $\int y \, dx$

(Total for question 5 is 4 marks)

6 Find $\int_1^3 (x + 4)(x - 3) \, dx$

(Total for question 6 is 5 marks)

7 $\frac{dy}{dx} = 10x^4 - 5$

Given that the point (2, 30) lies on the curve

Find an expression for y in terms of x

(Total for question 7 is 5 marks)

8 Find $\int_1^4 5 + \frac{1}{\sqrt{x}} \, dx$

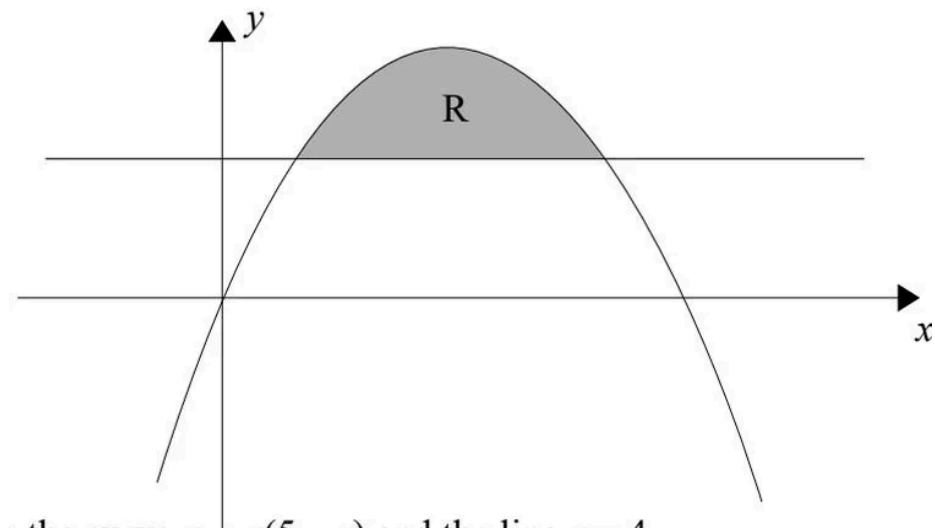
(Total for question 8 is 5 marks)

9 The curve with the equation $f(x)$ passes through the point $(1, 2)$

Given that $f'(x) = 5 + \frac{3x^2+2}{x^2}$

Find $f(x)$ giving your answer in its simplest form.

(Total for question 9 is 7 marks)



The sketch shows the curve $y = x(5 - x)$ and the line $y = 4$

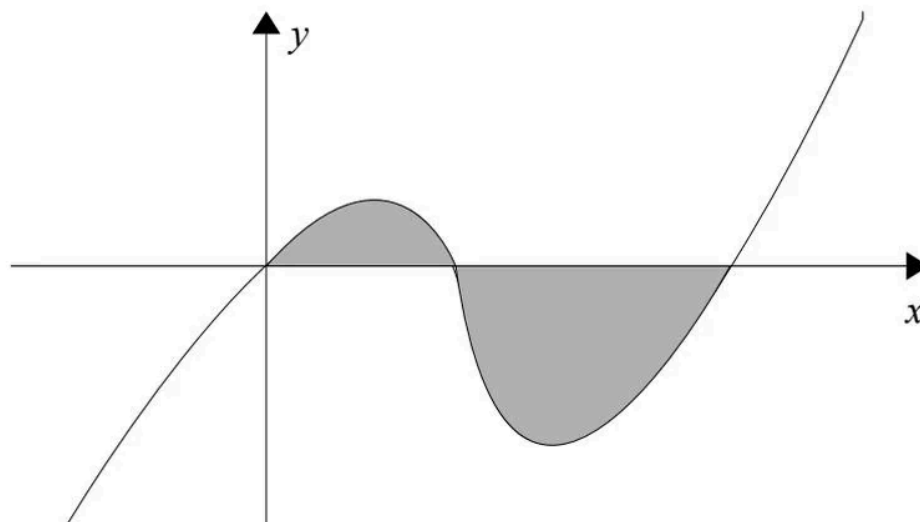
- (a) Find the coordinates of the points where the line intersects the curve.

(2)

(b) Find the area of the shaded region R.

(6)

(Total for question 10 is 8 marks)



The sketch shows the curve $y = x(x - 2)(x - 5)$

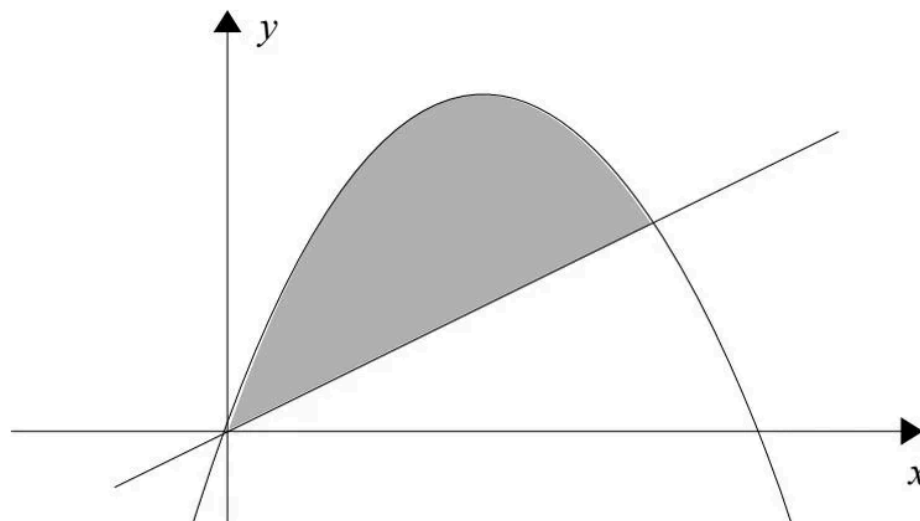
- (a) Write down the values of x where the curve crosses the x axis.

(1)

(b) Find the area of the shaded region.

(8)

(Total for question 11 is 9 marks)



The sketch shows the curve $y = 10x - x^2$ and the straight line $y = 2x$

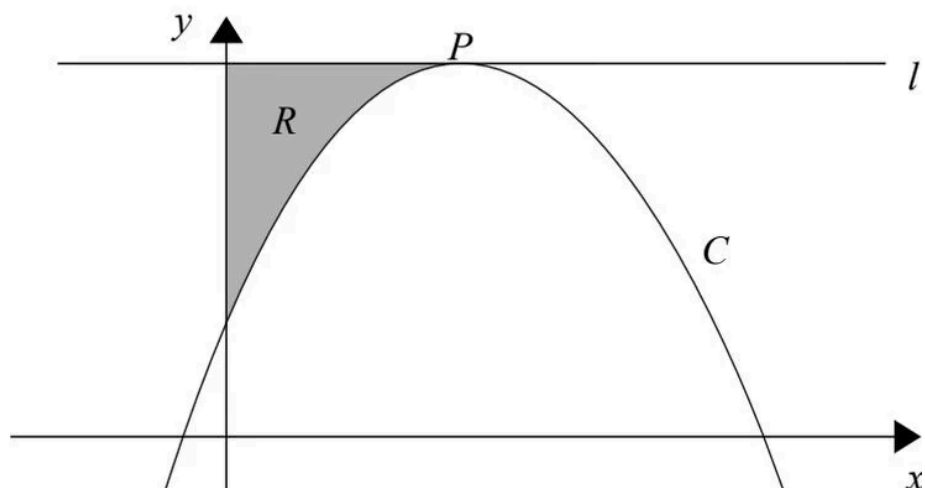
- (a) Find the coordinates of the points where the line intersects the curve.

(2)

(b) Find the area of the shaded region.

(6)

(Total for question 12 is 8 marks)



The sketch shows the curve C with equation $y = (x + 1)(8 - x)$. The maximum point of curve C is P . The line l passes through P and is parallel to the x -axis. The shaded region R is bounded by the curve C , the line l and the y -axis.

Find the area of the shaded region R .

(Total for question 13 is 10 marks)

14

$$\frac{dy}{dx} = \frac{1}{3x^2}$$

Find an expression for y in terms of x

(Total for question 14 is 3 marks)

- 15 $f'(x) = (2x - 1)^2$ and $f(2) = 5$
Find an expression for $f(x)$

(Total for question 15 is 4 marks)

- 16** A curve cuts the x -axis at $(2, 0)$ and has the gradient function

$$\frac{dy}{dx} = \frac{8}{x^2}$$

Find the equation of the curve

(Total for question 16 is 4 marks)

17 A curve C has equation

$$y = \frac{3}{2\sqrt{x}}$$

The region enclosed between the curve, the x -axis and the lines $x = 1$ and $x = k$ area 12 units.
Given $k > 1$, find the value of k . Fully justify your answer.

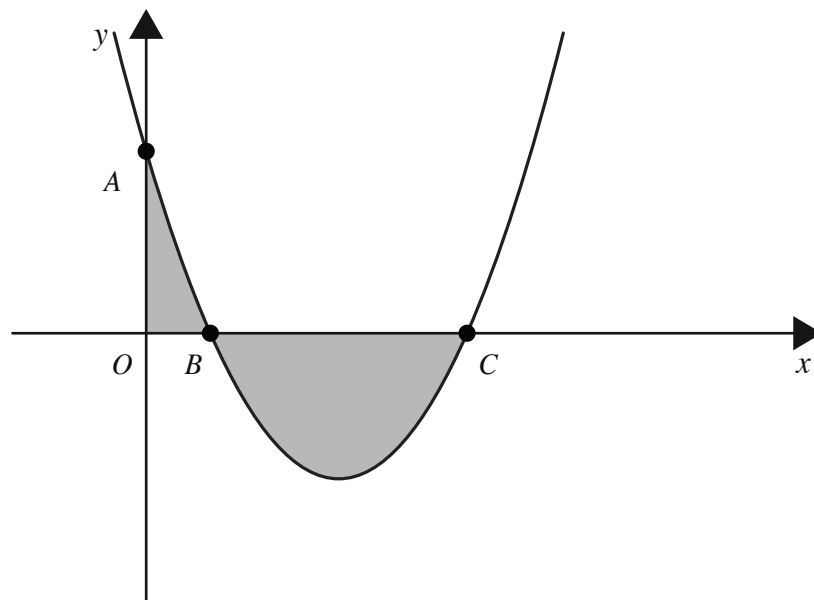
(Total for question 17 is 5 marks)

18

$$\frac{dy}{dx} = \frac{5}{x^2}$$

Find an expression for y

(Total for question 18 is 3 marks)



The diagram shows the curve with equation $y = x^2 - 6x + 5$

- (a) Write down the coordinates of the points A , B and C .

(3)

(b) Find the total area of the two shaded regions. Fully justify your answer.

(5)

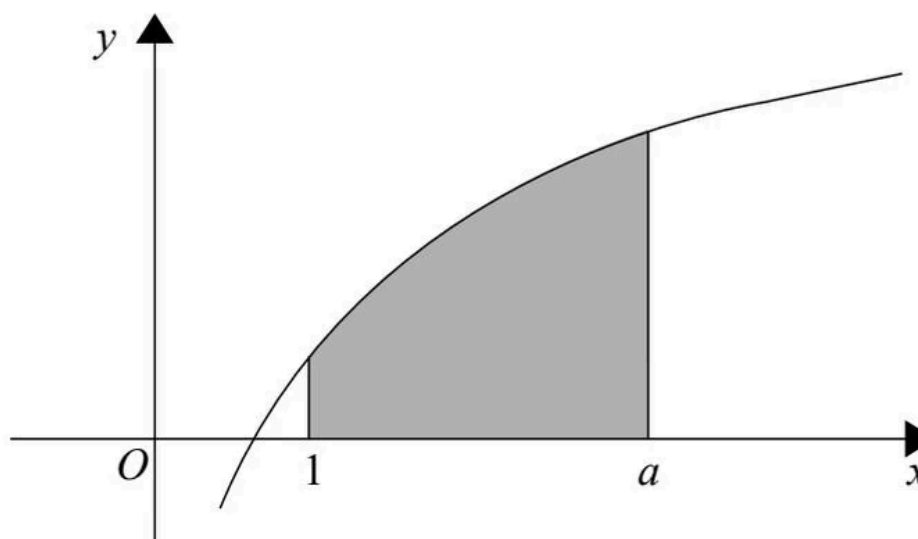
(Total for question 19 is 8 marks)

20 Find $\int (4\sqrt{x} - 2) dx$ writing your answer in its simplest form.

(Total for question 20 is 5 marks)

21 The diagram shows part of the graph of $y = 8x^{\frac{1}{3}} - \frac{4}{x^{\frac{1}{3}}}$

The shaded region is enclosed by the curve, the x -axis and the lines $x = 1$ and $x = a$, where $a > 1$



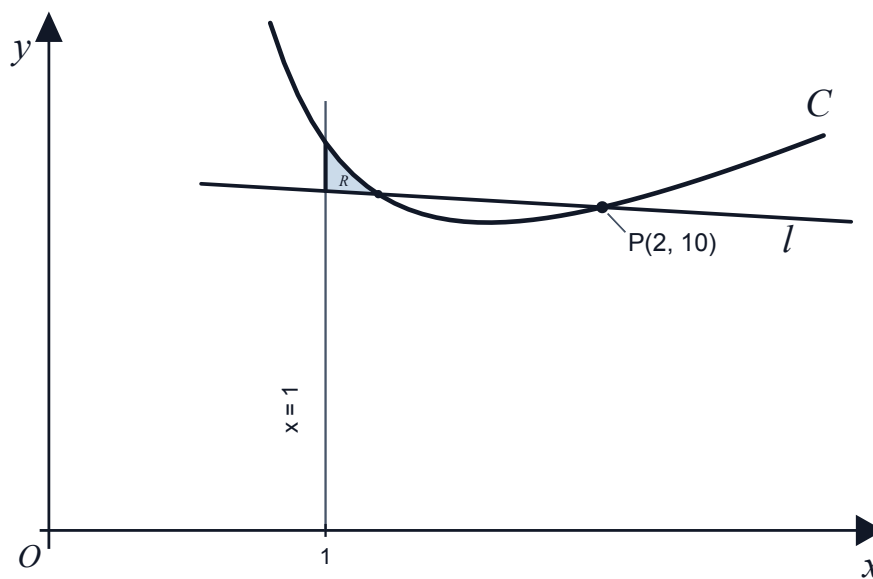
Given that the area of the shaded area is 36 square units, find the exact value of a .

(Total for question 21 is 9 marks)

22 Find $\int (2x^3 + \sqrt{x} + 2)dx$ Giving your answer in its simplest form.

(Total for question 22 is 4 marks)

- 23 The graph shows part of the curve with equation $y = \frac{8}{x^2} + 4x$



$P(2, 10)$ lies on C . Line l is the normal to C at P . Region R is bounded by the curve C , the line l and the line with equation $x = 1$.

Show that the area of R is 110.

(Total for question 23 is 10 marks)

24 Given that k is a constant

(a) Find $\int \left(\frac{k}{x^3} + 2x \right) dx$ Giving your answer in its simplest form.

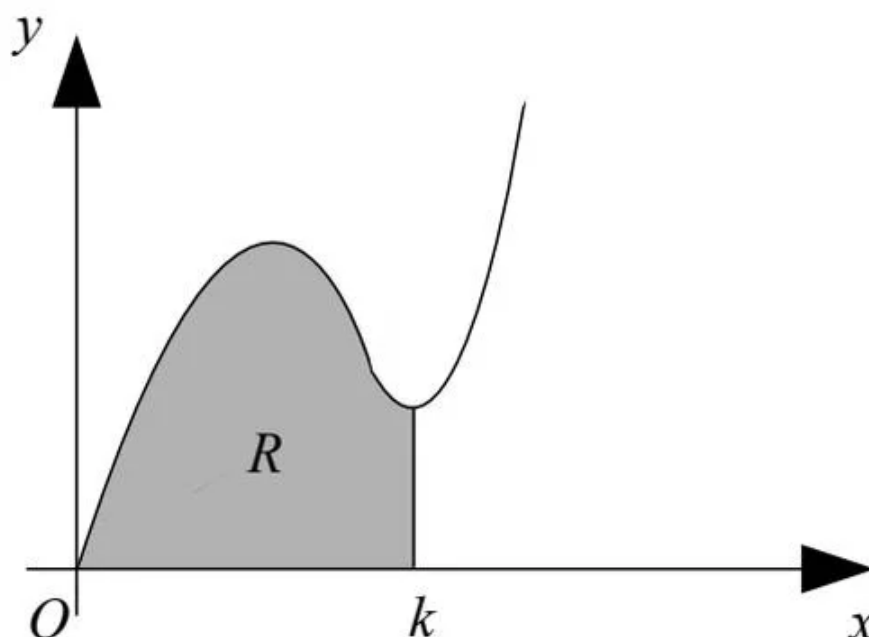
(3)

(b) Find the value of k such that $\int_1^2 \left(\frac{k}{x^3} + 2x \right) dx = 12$

(3)

(Total for question 24 is 6 marks)

- 25 The graph shows part of the curve C with equation $y = x^3 - 7x^2 + 15x$



The curve has a minimum turning point at k . Region R is bounded by the curve C , x -axis and the line with equation $x = k$.

Show that the area of R is $\frac{99}{4}$

(Total for question 25 is 7 marks)

26 Given that k is a positive constant and $\int_1^k \left(\frac{3}{2\sqrt{x}} + 9 \right) dx = 8$

(a) Show that $9k + 3\sqrt{k} - 20 = 0$

(4)

(b) Hence, using algebra, find any values of k such that $\int_1^k \left(\frac{3}{2\sqrt{x}} + 9 \right) dx = 8$

(4)

(Total for question 26 is 8 marks)

27 $f(x) = 2x^3 - x^2 - 8x + 4$

(a) Use the factor theorem to show that $(x + 2)$ is a factor of $f(x)$

(2)

(b) Hence, showing all your working, write $f(x)$ as a product of three linear factors.

(4)

- (c) The finite region R is bounded by the curve with equation $y = f(x)$ and the x -axis, and lies below the x -axis. Find, using algebraic integration, the exact value of the area of R .

(4)

(Total for question 27 is 10 marks)

- 28 Find $\int \left(\frac{4x^3 - 5}{3x^2} \right) dx$ writing your answer in its simplest form.

(Total for question 28 is 4 marks)

29 Find the value of k such that $\int_1^8 \left(\frac{k}{\sqrt[3]{x}} \right) dx = 22.5$

(Total for question 29 is 4 marks)

30 Find the value of k such that $\int_k^9 \left(\frac{10}{\sqrt{x}} \right) dx = 20$

(Total for question 30 is 4 marks)

31

(a) Find $\int (2x - x^2)dx$

(2)

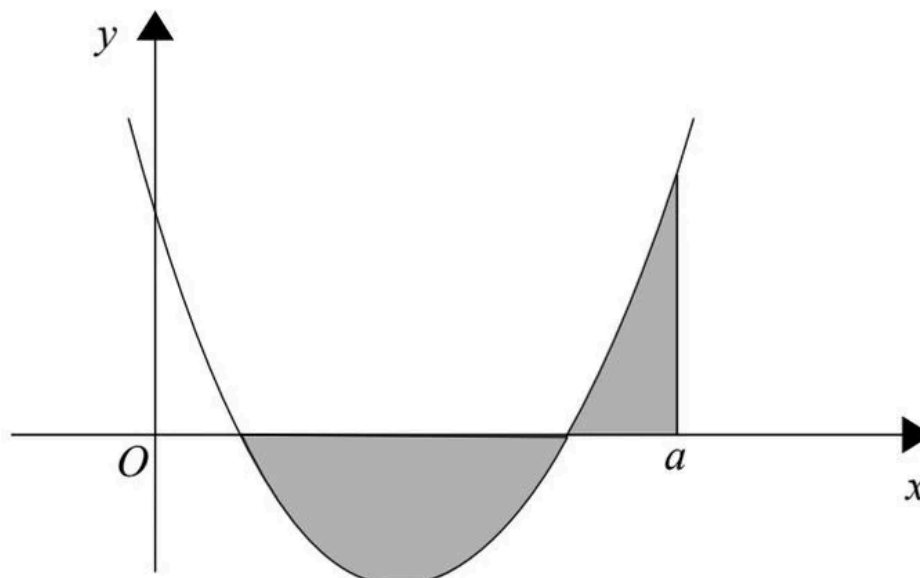
(b) Evaluate $\int_0^4 (2x - x^2)dx$

(2)

(c) Using a sketch, explain why the integral in part (b) does not give the area enclosed between the curve $y = 2x - x^2$ and the x -axis

(1)

(Total for question 31 is 5 marks)



The diagram shows the curve with equation $y = x^2 - 9x + 14$ and the line $x = a$.
Given the total area of the two shaded regions is 29 units^2 . Find the exact value of a .

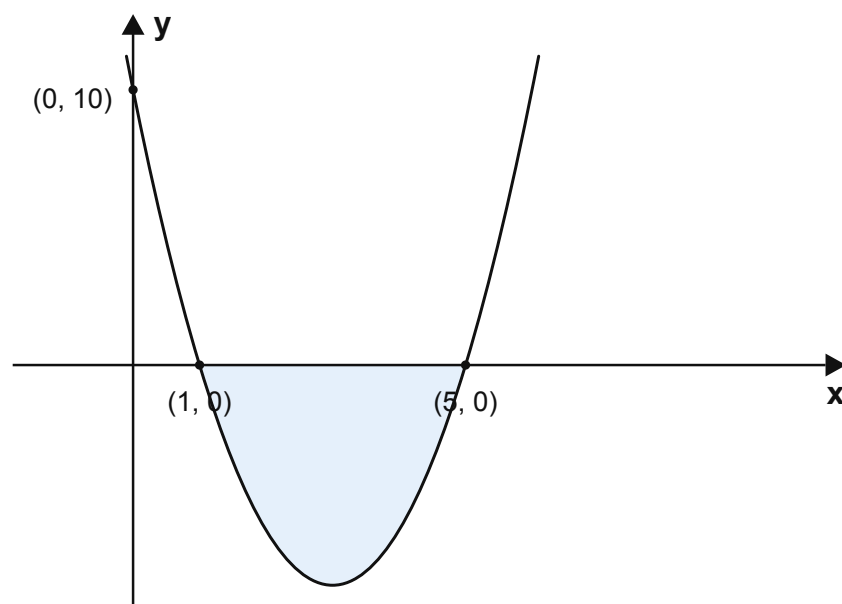
(Total for question 32 is 8 marks)

33 Find $\int \left(10 - \frac{6}{x^2}\right) dx$ writing your answer in its simplest form.

(Total for question 33 is 4 marks)

34 $f(x) = (x - 4)(x - 2)(x + 1)$
Find the total area enclosed by $f(x)$ and the x -axis

(Total for question 34 is 5 marks)



The sketch shows a quadratic graph that passes through $(0, 10)$, $(1, 0)$ and $(5, 0)$
Find the area of the finite region bounded by the curve and the x -axis.

(Total for question 35 is 8 marks)

36 Show that $\int_1^8 \left(\frac{16}{x^2}\right) dx = 14$

(Total for question 36 is 4 marks)

37 Show that $\int_1^4 (1 + 3\sqrt{x}) dx = 17$

(Total for question 37 is 4 marks)

38

(a) Find $\int x^2 \left(2x + \frac{25}{\sqrt{x}} \right) dx$

(5)

(b) Find $\int_1^9 x^2 \left(2x + \frac{25}{\sqrt{x}} \right) dx$

(3)

(Total for question 38 is 8 marks)

- 39** Use integration to show that the area enclosed by x -axis and the curve with equation $y = (x + 3)(x - 1)^2$ is $\frac{64}{3}$ square units.

(Total for question 39 is 6 marks)
