

# 12Ma Pure Mini Test 05

## Calculus (Differentiation and Integration)

Total 24 marks, 24 mins

### Question 1

Edexcel IAL P1 Oct 2021 Q10 (adapted)

A curve has equation  $y = f(x)$ ,  $x > 0$

Given that

- $f'(x) = kx - 12x^{\frac{1}{3}}$ , where  $k$  is a constant
- $f''(x) = 0$  when  $x = 27$
- the curve passes through the point  $(1, -8)$

(a) find the value of  $k$ .

[3]

(b) Hence find  $f(x)$ .

[4]

## Question 2

Edexcel IAL P2 June 2019 Q10 (adapted)

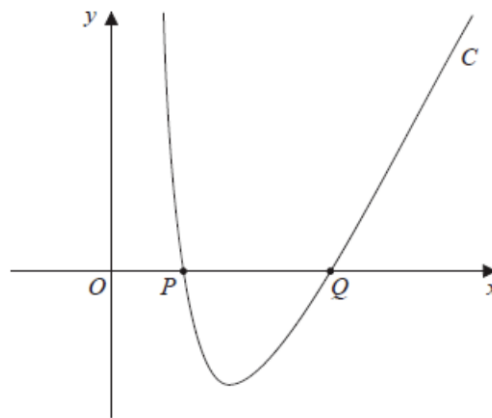


Figure 1

Figure 1 shows a sketch of part of the curve  $C$  with equation  $y = f(x)$  where

$$f(x) = \frac{36}{x^2} + 2x - 13 \quad x > 0$$

Using calculus,

(a) Show that  $\int_2^9 \left( \frac{36}{x^2} + 2x - 13 \right) dx = 0$

[4]

Given that

- the point  $P(2, 0)$  and the point  $Q(6, 0)$  lie on  $C$

- $\int_2^6 \left( \frac{36}{x^2} + 2x - 13 \right) dx = -8$

(b) state the value of  $\int_6^9 \left( \frac{36}{x^2} + 2x - 13 \right) dx$

[1]

(c) find the value of the constant  $k$  such that  $\int_2^6 \left( \frac{36}{x^2} + 2x + k \right) dx = 0$

[2]

### Question 3

Edexcel IAL P2 June 2019 Q8 (adapted)

In this question you must show all stages of your working.  
Solutions relying entirely on calculator technology are not acceptable.

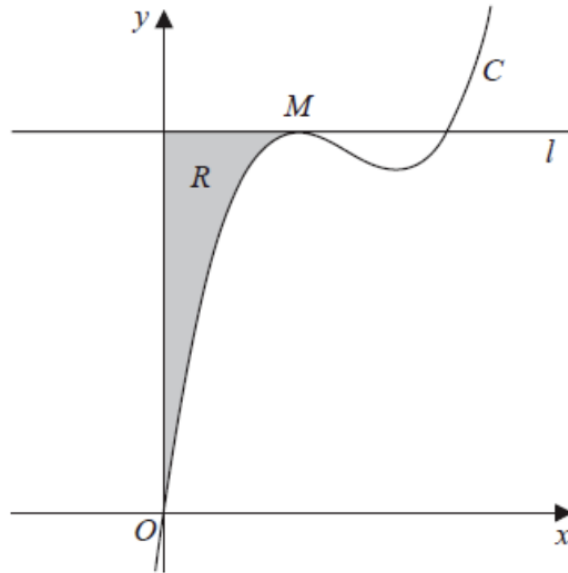


Figure 2

Figure 2 shows a sketch of part of the curve with equation

$$y = \frac{4}{3}x^3 - 11x^2 + kx \quad \text{where } k \text{ is a constant}$$

Given that  $M$  has an  $x$ -coordinate of 2 and is the maximum turning point of  $C$ .

(a) Show that  $k = 28$ .

[3]

(b) Determine the range of values of  $x$  for which  $y$  is increasing.

[2]

The line  $l$  passes through  $M$  and is parallel to the  $x$ -axis.

The region,  $R$ , shown shaded in Figure 2, is bounded by the curve  $C$ , the line  $l$ , and the  $y$ -axis.

(c) Find the exact area of  $R$ .

[5]