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IB Exam Revision - Online

Topic Exam

# Calculus

Video Solutions to this exam can be found at:

[www.revisionvillage.com/calculus-exam](http://www.revisionvillage.com/calculus-exam)

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Our aim is to simplify the process of revising for IB Exams

## Question 1

[Maximum mark: 6]



Let  $f'(x) = 3x^2 + 2x - 1$ . Given that  $f(2) = 5$ , find  $f(x)$ .

## Question 2

[Maximum mark: 6]



Let  $f(x) = e^{3x}$ . The line  $L$  is the tangent to the curve of  $f$  at  $(0, 1)$ .

Find the equation of  $L$  in the form  $y = mx + c$ .

### Question 3

[Maximum mark: 6]



Consider  $f(x) = x^3 - \frac{p}{x}$ ,  $x \neq 0$ , where  $p$  is a constant.

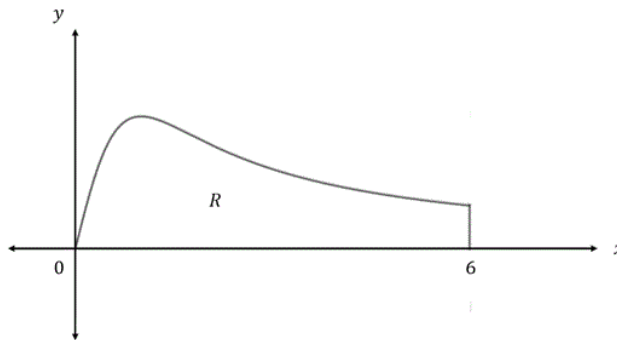
- (a) Find  $f'(x)$ . [3]
- (b) There is a minimum value of  $f(x)$  when  $x = 1$ . Find the value of  $p$ . [3]

### Question 4

[Maximum mark: 6]



The following diagram shows the graph of  $f(x) = \frac{4x}{x^2+1}$ , for  $0 \leq x \leq 6$ , and the line  $x = 6$ .



Let  $R$  be the region enclosed by the graph of  $f$ , the  $x$ -axis and the line  $x = 6$ .

Find the area of  $R$ .

## Question 5

[Maximum mark: 7]



Let  $f(x) = \frac{\ln x}{x}$ , for  $x > 0$ .

- (a) Find  $f'(x)$ . [3]
- (b) The graph of  $f$  has a maximum at point  $P$ . Find the coordinates of  $P$ . [4]

## Question 6

[Maximum mark: 6]



Let  $f(x) = e^{-3x}$ .

- (a) Write down  $f'(x)$ ,  $f''(x)$  and  $f'''(x)$ . [3]
- (b) Find an expression for  $f^{(n)}(x)$ . [3]

## Question 7

[Maximum mark: 7]



A farmer wants to build a rectangular enclosure for his chickens. The area of the enclosure must be  $350\text{m}^2$ . The fencing used for the side AB costs \$13 per metre. The fencing for the other three sides costs \$4 per metre. The farmer wants the cost of the enclosure to be a minimum. Find the minimum cost.





## Question 8

[Maximum mark: 7]



Let  $f(x) = g(x) \times h(x)$ , where  $g(3) = 6$ ,  $h(3) = 2$ ,  $g'(3) = 4$  and  $h'(3) = 1$ .

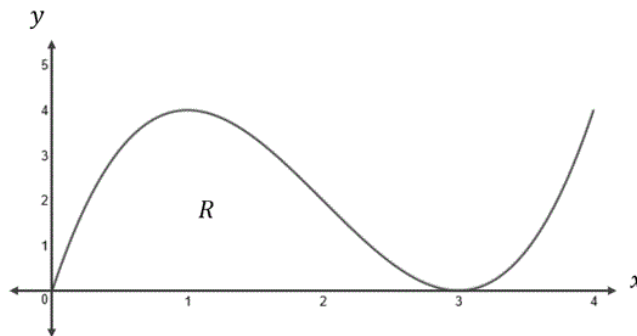
Find the equation of the normal to the graph of  $f$  at  $x = 3$ .

## Question 9

[Maximum mark: 15]

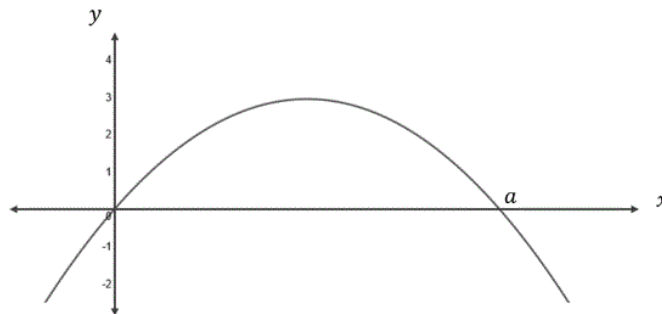


Let  $f(x) = x(x - 3)^2$ , for  $0 \leq x \leq 4$ . The following graph shows  $f$ .



Let  $R$  be the region enclosed by the  $x$ -axis and the curve of  $f$ .


- (a) Find the area of  $R$ . [4]
- (b) Find the volume of the solid formed when  $R$  is rotated  $360^\circ$  about the  $x$ -axis. [4]
- (c) The diagram below shows part of the graph of the quadratic function  $g(x) = x(a - x)$ . The graph of  $g$  crosses the  $x$ -axis when  $x = a$ .



The area enclosed by the graph of  $g$  is equal to the area of  $R$ . Find the value of  $a$ . [7]

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**Question 10**[Maximum mark: 15] Let  $f(x) = \sqrt{2x + 1}$  for  $x \geq -0.5$ .

- (a) Find
- (i)  $f(12)$ ;
  - (ii)  $f'(12)$ . [4]

Consider another function  $g(x)$ . Let  $P$  be a point on the graph  $g$ . The x-coordinate of  $P$  is 12. The equation of the tangent to the graph at  $P$  is  $y = x + 3$ .

- (b) Write down  $g'(12)$ . [2]
- (c) Find  $g(12)$ . [2]
- (d) Let  $h(x) = f(x) \times g(x)$ . Find the equation of the tangent of  $h$  at the point where  $x = 12$ . [7]