

Unit 5 Test: Integral Calculus

You may use a calculator on these problems

[30 marks]

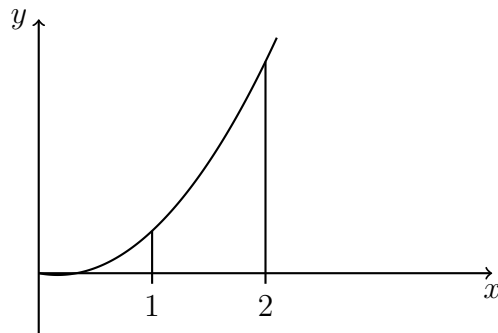
1. Let $f(x) = x^3 - 4x^2 - 7$. Find $f'(x)$. [2]
2. Let $f(x) = e^{3x-1}$. Find $f'(x)$. [2]
3. Let $f(x) = x \sin x$. Find $f'(x)$. [2]
4. Let $f(x) = \sqrt{x} + \ln x$. Find $f'(x)$. [2]
5. Find $\int x^3 \, dx$. [2]
6. Find $\int \sin x \, dx$. [2]
7. Find $\int e^{3x} \, dx$. [2]
8. Find $\int (2x + 4)(x^2 + 4x)^3 \, dx$. [2]
9. Find $\int_0^2 x^2 e^{-x} \, dx$. [4]
10. Find $\int_0^3 x - e^{0.5x} + 3 \, dx$. [4]
11. Let $f(x) = xe^{-x}$ and $g(x) = -3f(x) + 1$. [6 marks]
The graphs of f and g intersect at $x = p$ and $x = q$, where $p < q$.
 - (a) Find the values of f and q . [3]
 - (b) Hence, find the area of the region enclosed by the graphs of f and g . [3]

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No Calculator section

[38 marks]

12. Let $f(x) = 3x^2 - x$. The graph of f is shown in the following diagram. [6 marks]



- (a) Find $f'(x)$. [2]

- (b) Find the area of the region enclosed by the graph of f , the x -axis and the lines $x = 1$ and $x = 2$. [4]

13. Consider a function $f(x)$ such that $\int_1^6 f(x) \, dx = 8$. [6 marks]

- (a) Find $\int_1^6 2f(x) \, dx$. [2]

- (b) Find $\int_1^6 (f(x) + 2) \, dx$. [4]

14. 14M.1.sl.TZ2.5 [6 marks]

The graph of a function h passes through the point $(\frac{\pi}{12}, 5)$.
Given that $h'(x) = 4 \cos 2x$, find $h(x)$.

[6]

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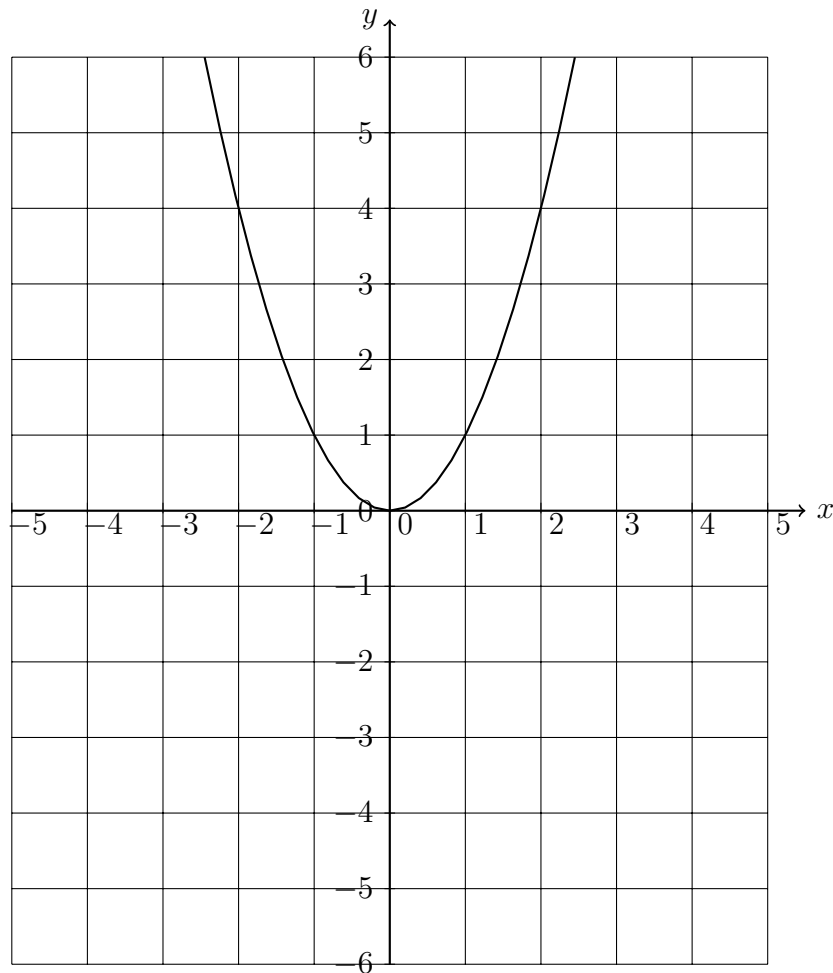
15. 18M.2.sl.TZ1.4

[7 marks]

Let $g(x) = -(x - 1)^2 + 5$.

(a) Write down the coordinates of the vertex of the graph of g . [1]

(b) Let $f(x) = x^2$. The following diagram shows part of the graph of f .



The graph of g intersects the graph of f at $x = -1$ and $x = 2$.

On the grid above, sketch the graph of g for $-2 \leq x \leq 4$. [3]

(c) Find the area of the region enclosed by the graphs of f and g . [3]

16. A function $f(x)$ has derivative $f'(x) = 3x^2 + 18x$. The graph of f has an x -intercept at $x = -1$. [13 marks]

(a) Find $f(x)$. [6]

(b) The graph of f has a point of inflexion at $x = p$. Find p . [4]

(c) Find the values of x for which the graph of f is concave-down. [3]