

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Differentiation and

Integration 1

Materials required for examination
Mathematical Formulae (Pink or Green)

Items included with question papers
Nil

Calculators may NOT be used in this examination.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

1.
$$f(x) = \frac{(3 - 4\sqrt{x})^2}{\sqrt{x}}, \quad x > 0.$$

(a) Show that $f(x) = 9x^{-\frac{1}{2}} + Ax^{\frac{1}{2}} + B$, where A and B are constants to be found.

(3)

(b) Find $f'(x)$.

(3)

(c) Evaluate $f'(9)$.

(2)

2. Find $\int (12x^5 - 8x^3 + 3) \, dx$, giving each term in its simplest form.

(4)

3. Given that $y = 2x^3 + \frac{3}{x^2}$, $x \neq 0$, find

(a) $\frac{dy}{dx}$,

(3)

(b) $\int y \, dx$, simplifying each term.

(3)

4. A curve has equation $y = f(x)$ and passes through the point $(4, 22)$.

Given that

$$f'(x) = 3x^2 - 3x^{\frac{1}{2}} - 7,$$

use integration to find $f(x)$, giving each term in its simplest form.

(5)

5. Given that $\frac{2x^2 - x^{\frac{3}{2}}}{\sqrt{x}}$ can be written in the form $2x^p - x^q$,

(a) write down the value of p and the value of q .

(2)

Given that $y = 5x^4 - 3 + \frac{2x^2 - x^{\frac{3}{2}}}{\sqrt{x}}$,

(b) find $\frac{dy}{dx}$, simplifying the coefficient of each term.

(4)

6. Find $\int (3x^2 + 4x^5 - 7) dx$. (4)

7. Find $\int (2 + 5x^2) dx$. (3)

8. $f(x) = 3x + x^3, \quad x > 0.$
(a) Differentiate to find $f'(x)$. (2)

Given that $f'(x) = 15$,

(b) find the value of x . (3)

9. Given that $y = 4x^3 - 1 + 2x^{\frac{1}{2}}, \quad x > 0,$
find $\frac{dy}{dx}$. (4)

10. The gradient of a curve C is given by $\frac{dy}{dx} = \frac{(x^2 + 3)^2}{x^2}, \quad x \neq 0.$
(a) Show that $\frac{dy}{dx} = x^2 + 6 + 9x^{-2}$. (2)

The point $(3, 20)$ lies on C .

(b) Find an equation for the curve C in the form $y = f(x)$. (6)

11. (a) Write $\frac{2\sqrt{x+3}}{x}$ in the form $2x^p + 3x^q$, where p and q are constants. (2)

Given that $y = 5x - 7 + \frac{2\sqrt{x+3}}{x}, \quad x > 0,$

(b) find $\frac{dy}{dx}$, simplifying the coefficient of each term. (4)

12. Given that $y = 3x^2 + 4\sqrt{x}$, $x > 0$, find

(a) $\frac{dy}{dx}$, (2)

(b) $\frac{d^2y}{dx^2}$, (2)

(c) $\int y \, dx$. (3)

13. (a) Show that $(4 + 3\sqrt{x})^2$ can be written as $16 + k\sqrt{x} + 9x$, where k is a constant to be found. (2)

(b) Find $\int (4 + 3\sqrt{x})^2 \, dx$. (3)

14. Differentiate with respect to x

(a) $x^4 + 6\sqrt{x}$, (3)

(b) $\frac{(x+4)^2}{x}$. (4)

15. (i) Given that $y = 5x^3 + 7x + 3$, find

(a) $\frac{dy}{dx}$, (3)

(b) $\frac{d^2y}{dx^2}$. (1)

(ii) Find $\int \left(1 + 3\sqrt{x} - \frac{1}{x^2} \right) dx$. (4)

16. (a) Show that $\frac{(3 - \sqrt{x})^2}{\sqrt{x}}$ can be written as $9x^{-\frac{1}{2}} - 6 + x^{\frac{1}{2}}$. (2)

Given that $\frac{dy}{dx} = \frac{(3 - \sqrt{x})^2}{\sqrt{x}}$, $x > 0$, and that $y = \frac{2}{3}$ at $x = 1$,

(b) find y in terms of x . (6)

17. Given that $y = 2x^2 - \frac{6}{x^3}$, $x \neq 0$,

(a) find $\frac{dy}{dx}$, (2)

(b) find $\int y \, dx$. (3)

18. The curve with equation $y = f(x)$ passes through the point $(1, 6)$. Given that

$$f'(x) = 3 + \frac{5x^2 + 2}{x^{\frac{1}{2}}}, \quad x > 0,$$

find $f(x)$ and simplify your answer. (7)

19. Given that $y = 6x - \frac{4}{x^2}$, $x \neq 0$,

(a) find $\frac{dy}{dx}$, (2)

(b) find $\int y \, dx$. (3)

END