Integration - Edexcel Past Exam Questions

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

Jan 05 Q2

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2. The gradient of the curve C is given by

$$\frac{\mathrm{d}y}{\mathrm{d}x} = (3x - 1)^2.$$

The point $P(1, 4)$ lies on C.

(a) Find an equation of the normal to C at P. **(4)**

(b) Find an equation for the curve C in the form $y = \mathrm{f}(x)$. **(5)**

(c) Using $\frac{\mathrm{d}y}{\mathrm{d}x} = (3x - 1)^2$, show that there is no point on C at which the tangent is parallel to the line $y = 1 - 2x$. **(2)**

Jan 05 Q9

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3. Given that $y = 6x - \frac{4}{x^2}$, $x \neq 0$, find $\int y \, \mathrm{d}x$. **(3)**

June 05 Q2

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4. Given that $\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{(3 - \sqrt{x})^2}{\sqrt{x}}$, $x > 0$, and that $y = \frac{2}{3}$ at $x = 1$,

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

June 05 Q7

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

find $\int y \, \mathrm{d}x$. **(3)**

Jan 06 Q4

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6. 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)**

Jan 06 Q8

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7. Find $\int (6x^2 + 2 + x^{-\frac{1}{2}})\ dx$, giving each term in its simplest form. **(4)**

June 06 Q1

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8. The curve C with equation $y = f(x)$, $x \neq 0$, passes through the point $(3, 7\frac{1}{2})$.

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

(*a*) find $f(x)$. **(5)**

(*b*) Verify that $f(-2) = 5$. **(1)**

(*c*) Find an equation for the tangent to C at the point (–2, 5), giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(4)**

June 06 Q10

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9. (*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)**

Jan 07 Q6

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10. The curve C has equation $y = f(x)$, $x \neq 0$, and the point $P(2, 1)$ lies on C. Given that

$$f'(x) = 3x^2 - 6 - \frac{8}{x^2},$$

(*a*) find $f(x)$. **(5)**

(*b*) Find an equation for the tangent to C at the point P, giving your answer in the form $y = mx + c$, where m and c are integers. **(4)**

Jan 07 Q7

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

(c) $\int y \ \mathrm{d}x$. **(3)**

June 07 Q3

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12. The curve C with equation $y = \mathrm{f}(x)$ passes through the point (5, 65).

Given that $\mathrm{f}'(x) = 6x^2 - 10x - 12$,

(a) use integration to find $\mathrm{f}(x)$. **(4)**

(b) Hence show that $\mathrm{f}(x) = x(2x + 3)(x - 4)$. **(2)**

(c) Sketch C, showing the coordinates of the points where C crosses the x-axis. **(3)**

June 07 Q9

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13. Find $\int (3x^2 + 4x^5 - 7) \ \mathrm{d}x$. **(4)**

Jan 08 Q1

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14. The curve C has equation $y = \mathrm{f}(x)$, $x > 0$, and $\mathrm{f}'(x) = 4x - 6\sqrt{x} + \frac{8}{x^2}$.

Given that the point $P(4, 1)$ lies on C,

(a) find $\mathrm{f}(x)$ and simplify your answer. **(6)**

(b) Find an equation of the normal to C at the point $P(4, 1)$. **(4)**

Jan 08 Q9

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15. Find $\int (2 + 5x^2) \ \mathrm{d}x$. **(3)**

June 08 Q1

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16. The gradient of a curve C is given by $\frac{dy}{dx} = \frac{(x^2+3)^2}{x^2}$, $x \neq 0$.

(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)**

June 08 Q11

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17. Find $\int (12x^5 - 8x^3 + 3)\ dx$, giving each term in its simplest form. **(4)**

Jan 09 Q2

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18. 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)**

Jan 09 Q4

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

$\int y\ dx$, simplifying each term. **(3)**

June 09 Q3

20.
$$\frac{dy}{dx} = 5x^{-\frac{1}{2}} + x\sqrt{x}, \qquad x > 0.$$

Given that $y = 35$ at $x = 4$, find y in terms of x, giving each term in its simplest form. **(7)**

Jan 10 Q4

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21. Find

$$\int (8x^3 + 6x^{\frac{1}{2}} - 5) \ \mathrm{d}x,$$

giving each term in its simplest form. **(4)**

June 10 Q2

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22. The curve C has equation $y = \mathrm{f}(x)$, $x > 0$, where

$$\frac{\mathrm{d}y}{\mathrm{d}x} = 3x - \frac{5}{\sqrt{x}} - 2.$$

Given that the point P (4, 5) lies on C, find

(a) f(x), **(5)**

(b) an equation of the tangent to C at the point P, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(4)**

June 10 Q11

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23. Find

$$\int (12x^5 - 3x^2 + 4x^{\frac{1}{3}}) \ \mathrm{d}x,$$

giving each term in its simplest form. **(5)**

Jan 11 Q2

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24. The curve with equation $y = \mathrm{f}(x)$ passes through the point $(-1, 0)$.

Given that $\mathrm{f}'(x) = 12x^2 - 8x + 1,$

find f(x). **(5)**

Jan 11 Q7

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25. Given that $y = 2x^5 + 7 + \frac{1}{x^3}$, $x \neq 0$, find, in their simplest form, $\int y \ \mathrm{d}x$. **(4)**

June 11 Q2

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26. Given that $\frac{6x + 3x^{\frac{5}{2}}}{\sqrt{x}}$ can be written in the form $6x^p + 3x^q$,

(a) write down the value of p and the value of q. **(2)**

Given that $\frac{dy}{dx} = \frac{6x + 3x^{\frac{5}{2}}}{\sqrt{x}}$ and that $y = 90$ when $x = 4$,

(b) find y in terms of x, simplifying the coefficient of each term. **(5)**

June 11 Q6