Integration - Past Edexcel Exam Questions

1. (a) Given that $y = 5x^2 + 7x + 3$, find

    i. -

    ii. -

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

   . **Question 2b - January 2005**

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2. The gradient of the curve C is given by

$$\frac{dy}{dx} = (3x - 1)^2$$

   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 $y = f(x)$. [5]

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

   Question 9 - January 2005

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

   (a) -

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

   Question 2b - May 2005

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4. (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]

Question 7 - May 2005

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

   (a) -

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

Question 4b - January 2006

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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]

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Question 8 - January 2006

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

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Question 1 - May 2006

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

   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. [5]

Question 10 - May 2006

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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]

Question 6 - January 2007

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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]

Question 7 - January 2007

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

   (a) -

   (b) -

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

Question 3c - May 2007

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

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

   (a) Use integration to find $f(x)$. [4]

   (b) Hence show that $f(x) = x(2x+3)(x-4)$. [2]

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

Question 9 - May 2007

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13. Find $\int (3x^2 + 4x^5 - 7)\, dx$. [4]

. **Question 1 - January 2008**

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

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

    (a) find $f(x)$ and simplify your answer. [6]

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

Question 9 - January 2008

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15. Find $\int (2 + 5x^2)\, dx$. [3]

. **Question 1 - June 2008**

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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]

Question 11 - June 2008

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

Question 2 - January 2009

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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]

. **Question 4 - January 2009**

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

    (a) -

    (b) $\int y\, dx$, simplifying each term. [3]

Question 3b - June 2009

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

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

. [7]

. **Question 4 - January 2010**

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21. Find
$$\int \left(8x^3 + 6x^{\frac{1}{2}} - 5\right) dx,$$
giving each term in its simplest form. [4]

. **Question 2 - May 2010**

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

$$\frac{dy}{dx} = 3x - \frac{5}{\sqrt{x}} - 2.$$

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]

Question 11 - May 2010

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23. Find

$$\int \left(12x^5 - 3x^2 + 4x^{\frac{1}{3}}\right) dx,$$

giving each term in its simplest form. [5]

. **Question 2 - January 2011**

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

Given that

$$f'(x) = 12x^2 - 8x + 1$$

find $f(x)$. [5]

. **Question 7 - January 2011**

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25. Given that $y = 2x^5 + 7 + \frac{1}{x^3}$, $x \neq 0$, find, in their simplest form

(a) -

(b) $\int y \, dx$. [4]

Question 2b - May 2011

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

(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]

Question 6 - May 2011

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27. Given that $y = x^4 + 6x^{\frac{1}{2}}$, find in their simplest form

(a) -

(b) $\int y\, dx$. [3]

Question 1b - January 2012

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28. A curve with equation $y = f(x)$ passes through the point (2,10). Given that

$$f'(x) = 3x^2 - 3x + 5,$$

find the value of $f(1)$. [5]

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Question 7 - January 2012

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29. Find

$$\int \left(6x^2 + \frac{2}{x^2} + 5\right) dx$$

giving each term in its simplest form. [4]

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Question 1 - May 2012

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30. The point $P(4, -1)$ lies on the curve C with equation $y = f(x)$, $x > 0$, and

$$f'(x) = \frac{1}{2}x - \frac{6}{\sqrt{x}} + 3.$$

(a) Find the equation of the tangent to C at the point P, giving your answer in the form $y = mx + c$, where m and c are integers. [4]

(b) Find $f(x)$. [4]

Question 7 - May 2012

31.
$$\frac{dy}{dx} = -x^3 + \frac{4x-5}{2x^3}, \quad x \neq 0$$

Given that $y = 7$ at $x = 1$, find y in terms of x, giving each term in its simplest form.
. [6]
. **Question 8 - January 2013**

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32. Find
$$\int \left(10x^4 - 4x - \frac{3}{\sqrt{x}}\right) dx$$

giving each term in its simplest form. [4]
. **Question 2 - May 2013**

33.
$$f'(x) = \frac{(3-x^2)^2}{x^2}, \quad x \neq 0$$

(a) Show that $f'(x) = 9x^{-2} + A + Bx^2$, where A and B are constants to be found. [3]

(b) Find $f''(x)$. [2]

Given that the point (-3, 10) lies on the curve with equation $y = f(x)$,

(c) find $f(x)$. [5]

Question 9 - May 2013

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34. Find
$$\int (8x^3 + 4)\, dx$$

giving each term in its simplest form. [3]
. **Question 1 - May 2014**

35. A curve with equation $y = f(x)$ passes through the point (4, 25).

Given that

$$f'(x) = \frac{3}{8}x^2 - 10x^{-\frac{1}{2}} + 1, \quad x > 0$$

(a) find $f(x)$, simplifying each term. [5]

(b) Find an equation of the normal to the curve at the point (4, 25).

Give your answer in the form $ax + by + c = 0$, where a, b and c are integers to be found. [5]

Question 10 - May 2014

Solutions

1. (a) -

   (b) $x + 2x^{\frac{3}{2}} + x^{-1} + c$

2. (a) $y = -\frac{1}{4}x + \frac{17}{4}$

   (b) $y = 3x^3 - 3x^2 + x + 3$

   (c) -

3. (a) -

   (b) $3x^2 + 4x^{-1} + c$

4. (a) -

   (b) $y = 18x^{\frac{1}{2}} - 6x + \frac{2}{3}x^{\frac{3}{2}} - 12$

5. (a) -

   (b) $\frac{2}{3}x^3 + 3x^{-4} + c$

6. $y = 3x + 2x^{\frac{5}{2}} + 4x^{\frac{1}{2}} - 3$

7. $2x^3 + 2x + 2x^{\frac{1}{2}} + c$

8. (a) $x^2 - 3x^{-1} - \frac{1}{2}$

   (b) -

   (c) $13x + 4y + 6 = 0$

9. (a) $k = 24$

   (b) $16x + 16x^{\frac{3}{2}} + \frac{9}{2}x^2 + c$

10. (a) $x^3 - 6x + 8x^{-1} + 1$

    (b) $y = 4x - 7$

11. (a) -

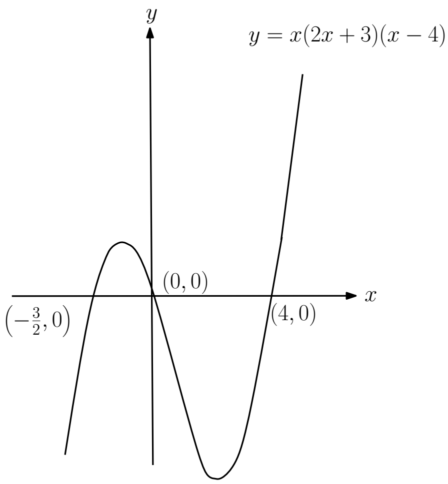
    (b) -

    (c) $x^3 + \frac{8}{3}x^{\frac{3}{2}} + c$

12. (a) $2x^3 - 5x^2 - 12x$

    (b) -

(c) .



13. $x^3 + \frac{2}{3}x^6 - 7x + c$

14. (a) $2x^2 - 4x^{\frac{3}{2}} - 8x^{-1} + 3$

    (b) $y = -\frac{2}{9}x + \frac{17}{9}$

15. $2x + \frac{5}{3}x^3 + c$

16. (a) -

    (b) $y = \frac{1}{3}x^3 + 6x - 9x^{-1} - 3$

17. $2x^6 - 2x^4 + 3x + c$

18. $x^3 - 2x^{\frac{3}{2}} - 7x + 2$

19. (a) -

    (b) $\frac{1}{2}x^4 - 3x^{-1} + c$

20. $10x^{\frac{1}{2}} + \frac{2}{5}x^{\frac{5}{2}} + \frac{11}{5}$

21. $2x^4 + 4x^{\frac{3}{2}} + 5x + c$

22. (a) $\frac{3}{2}x^2 - 10x^{\frac{1}{2}} - 2x + 9$

    (b) $15x - 2y - 50 = 0$

23. $2x^6 - x^3 + 3x^{\frac{4}{3}} + c$

24. $4x^3 - 4x^2 + x + 9$

25. (a) -

(b) $\frac{1}{3}x^6 + 7x - \frac{1}{2}x^{-2} + c$

26. (a) $p = \frac{1}{2}$, $q = 2$

    (b) $4x^{\frac{3}{2}} + x^3 - 6$

27. (a) -

    (b) $\frac{1}{5}x^5 + 4x^{\frac{3}{2}} + c$

28. $\frac{5}{2}$

29. $2x^3 - 2x^{-1} + 5x + c$

30. (a) $y = 2x - 9$

    (b) $\frac{1}{4}x^2 - 12x^{\frac{1}{2}} + 3x + 7$

31. $-\frac{1}{4}x^4 - 2x^{-1} + \frac{5}{4}x^{-2} + 8$

32. $2x^5 - 2x^2 - 6x^{\frac{1}{2}} + c$

33. (a) $A = -6$, $B = 1$

    (b) $-18x^{-3} + 2x$

    (c) $-9x^{-1} - 6x + \frac{1}{3}x^3 - 2$

34. $2x^4 + 4x + c$

35. (a) $\frac{1}{8}x^3 - 20x^{\frac{1}{2}} + x + 53$

    (b) $x + 2y - 54 = 0$