Name	Date started	Target end date

WJEC Level 2 Additional Mathematics — Question Pack

Integrating polynomials (reverse differentiation), finding constants of integration and evaluating definite integrals.

REVISE
.wales

Integration

Calculus · Level 2 Certificate (9550) · calculator allowed

Integrating polynomials (reverse differentiation), finding constants of integration and evaluating definite integrals.

LEVEL 2 · 9550

Estimated time for entire question pack: ~2 hours 38 minutes

*At the Additional Maths pace of **~1.2 min/mark** (132 marks across 15 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. It gathers every question on this topic from the 2011–2024 papers.

Questions are ordered by year, newest first.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

A calculator is allowed throughout this qualification.

Integration — what's examined

WJEC Level 2 Additional Mathematics (9550) · single written paper, calculator allowed.

Indefinite integral Calculus

- Add 1 to the power, divide by the new power.
- Add a constant of integration, +c.
- Integrate each term.

Finding c Calculus

- Use a given point to find c.
- Substitute and solve.
- Write the full expression for y.

Definite integral Calculus

- Integrate, then substitute the limits.
- Subtract: top minus bottom.
- No +c needed.

Crib sheet »

Integration in one page

Quick-reference notes — revisit before each question. Don’t use during the questions.

Power rule (reverse)

$$\int ax^n \, dx = ax^{n+1}/(n+1) + c$$

Don’t forget +c

Every indefinite integral needs a constant of integration.

Finding c

Substitute the given point into y to solve for c.

Definite

$$\int_a^b f' \, dx = [F]_a^b = F(b) - F(a)$$

7. Find $\int\left(55x^{10}-6-\frac{10}{x^6}\right)\mathrm{d}x$.

Simplify your answer.

You must show all your working. [5]

8. Find, using an algebraic method, the coordinates of the points of intersection of

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

Give your answers correct to 2 decimal places.

You must show all your working. [6]

11. (a) Find $\int\left(14x^6 - 5 + \frac{4}{x^3}\right)\mathrm{d}x$.

Simplify your answer.

You must show all your working. [5]

(b) Evaluate $\int_2^3 \left(8x^3 + 4x\right)\mathrm{d}x$.

You must show all your working. [4]

12.

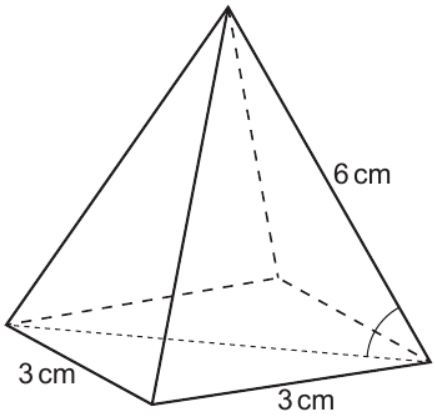

Diagram not drawn to scale

A square-based pyramid has base sides of length 3 cm and sloping edges of length 6 cm.

Calculate the angle between the diagonal of the base and the 6 cm sloping edge shown. [5]

12. (a) Find $\int\left(16x^7+15x^4-4+\frac{6}{x^4}\right)\mathrm{d}x$.

Simplify your answer.

You must show all your working. [6]

(b) Evaluate $\int_2^3\left(3x^2+2x\right)\mathrm{d}x$.

You must show all your working. [4]

13. Find the x-coordinate and the nature of each of the stationary points on the curve

$$y = \frac{x^3}{3} - \frac{7x^2}{2} + 10x\,.$$

You must show all your working. [7]

12. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 2x^8 + 4x^2 + 6$. [2]

(b) Find $\int\left(5x^4 + 3x^{-2} - \frac{2}{x^3}\right)\mathrm{d}x$. [4]

(c) Showing all your working, evaluate $\int_2^3 (6x + 10)\,\mathrm{d}x$. [5]

13. Find the equation of the tangent to the curve $y = 5x^2 + 7$ at the point where $x = 2$.
Express your answer in the form $y = mx + c$. [6]

10. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 2x^{16}$. [2]

(b) Given the following facts, find the values of a, b, c and d.

- $y = ax^3 + bx^2 + cx + d$
- $\frac{dy}{dx} = 12x^2 + 4x + 1$
- When $x = 1$, $y = 10$. [4]

$a =$ ..... $b =$ ..... $c =$ ..... $d =$ .....

11. The coordinates of the points *A* and *B* are (10, 16) and (–6, 8) respectively.

(a) Calculate the length of the line *AB*.
Express your answer as a surd in its simplest form, $n\sqrt{m}$. [3]

(b) Find the equation of the straight line **perpendicular** to *AB* that passes through the midpoint of *AB*.
Express your answer in the form $y = mx + c$.
Give your answer in its simplest form. [8]

12. Find $\int (12x^5 + 24x^3 - 2 + \frac{4}{x^5})dx$.

Simplify your answer.
You must show all your working. [6]

13. Find the coordinates and the nature of each of the stationary points on the curve $y = 2x^3 + 12x^2 + 11$.
You must show all your working. [7]

8. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 3x^{20}$. [2]

(b) Given the following facts, find the values of a, b and c.

- $y = ax^4 + bx^3 + c$
- $\frac{dy}{dx} = 12x^3 + 6x^2$
- when $x = 0$, $y = -6$ [3]

$a =$ ..... $b =$ ..... $c =$ .....

9. Do not use a calculator to answer this question.
All working must be shown.

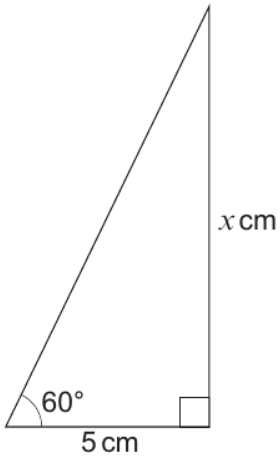

Diagram not drawn to scale

Calculate the value of x.
Give your answer in surd form.
You must show all your calculations. [2]

10. *(a)* Find $\int\left(10x^4+24x^2-2+\frac{3}{x^4}\right)dx$. [5]

(b) Evaluate $\int_1^2\left(12x^3+6x^2\right)dx$.

You must show all your working. [5]

11. Find the coordinates and the nature of each of the stationary points on the curve $y = 3x^3 + 9x^2 + 4$.
You must show all your working. [7]

12. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 3x^7 + 4x$. [2]

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

(c) Showing all your working, evaluate $\int_2^3 (8x + 2)\,dx$. [5]

13. Find the equation of the tangent to the curve $y = 3x^2 + 6$ at the point where $x = 3$. [6]

8. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 2x^{10}$. [2]

(b) Given the following facts, find the values of a, b and c.

- $y = ax^5 + bx + c$
- $\frac{d^2y}{dx^2} = 20x^3$
- when $x = 0$, $y = 5$
- when $x = 1$, $y = 9$ [3]

9. *(a)* Find $\int 21x^6 - 3x^2 - \frac{1}{x^2} + 6 \, dx$. [5]

(b) Showing all your working, evaluate $\int_2^5 6x^2 + 4x \, dx$. [5]

9. *(a)* Find $\int 21x^6 - 3x^2 - \frac{1}{x^2} + 6 \, dx$. [5]

(b) Showing all your working, evaluate $\int_2^5 6x^2 + 4x \, dx$. [5]

10. Do not use a calculator to answer this question.
All working must be shown.

(a) Use fractions and surds to show that $(\sin 30°)^2 + (\cos 30°)^2 = 1$.
You must show all your calculations. [2]

(b) Use fractions and surds to evaluate $5\tan 45° + 2\sin 60° + \tan 60°$.
You must show all your calculations and simplify your answer. [3]

12. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 2x^6 + 3x$. [2]

(b) Find $\int 3x^4 + 6x + 8x^{-2}\,dx$. [4]

(c) Showing all your working, evaluate $\int_2^5 4x + 1\,dx$. [5]

13. The following equations represent straight lines.

$$2x + 4y = 7$$
$$2x + 5y = 7$$
$$x + 2y = 7$$
$$4x - 2y = 7$$
$$2x - 4y = 7$$

(a) Which equations represent lines that are parallel?
You must explain how you know that these lines are parallel. [2]

(b) Write down any two of the equations that represent lines that are perpendicular.
You must explain how you know that these lines are perpendicular. [3]

7. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 6x^9$.

[2]

(b) Find $\int 3x^4 + \frac{1}{x^3} + 4\,dx$.

[4]

(c) Showing all your working, evaluate $\int_2^3 6x^5 + 5\,dx$.

[5]

8. *(a)* Find the remainder when $7x^3 - 4x^2 + x - 2$ is divided by $x - 2$.

[2]

(b) (i) Show that $x + 3$ is a factor of $x^3 + 4x^2 - 17x - 60$.

[2]

(ii) **Hence**, factorise $x^3 + 4x^2 - 17x - 60$.

8. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 6x^4 + 4x$.

[2]

(b) Find $\int 3x^2 + \frac{4}{x^3} + 8x \, dx$.

(c) Showing all your working, evaluate $\int_2^4 6x + 1 \, dx$.

[5]

9. *(a)* Factorise $15x^2 - x - 6$.

Hence solve the equation $15x^2 - x - 6 = 0$.

[4]

(b) Use the method of completing the square to find the least value of $x^2 + 10x + 15$.

[3]

9. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 5x^8$.

[2]

(b) Find $\int\left(4x^6 + \frac{1}{x^2} + 9\right)dx$.

[4]

(c) Evaluate $\int_1^2 \left(3x^2 + 1\right)dx$.

End of question pack