EXCEL IN MATHSCI
HIGHER MATHEMATICS • TOPIC RESOURCE

2026–27
Portfolio 8

Integration

PUPIL WORKSHEET

Skills covered: Indefinite integrals; fractional and negative powers; standard composite-function integrals; trigonometric integrals; definite integrals; initial conditions.

Instructions: Attempt all questions. Show sufficient working to justify your answers. Give exact values unless a degree of accuracy is stated. Each section is separate for targeted revision.

Prerequisite core skills revise earlier learning; *topic practice* develops individual techniques; *exam-style and challenge* combines skills.

Pupil: _____ **Date:** _____

SECTION A | Prerequisite core skills

Question 1

[3 marks]

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

Question 2

[3 marks]

Find $\int 5\sqrt{x}\,dx$, where $x > 0$.

Question 3

[3 marks]

Find $\int \left(\frac{4}{x^3} + x^2\right)\,dx$, where $x \neq 0$.

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Question 4

[2 marks]

Find $\int 3\sin x\,dx$, where x is in radians.

Question 5

[2 marks]

Find $\int 4\cos x\,dx$, where x is in radians.

Question 6

[3 marks]

Find $\int (2x-3)^4\,dx$.

SECTION B | Topic practice

Question 7

[3 marks]

Evaluate $\int_0^2 (3x^2+2x)\,dx$.

Question 8

[3 marks]

Evaluate $\int_1^3 (6x-4)\,dx$.

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Question 9

[3 marks]

Find $\int \cos 3x \, dx$.

Question 10

[3 marks]

Find $\int \sin\left(2x + \frac{\pi}{3}\right) \, dx$.

Question 11

[4 marks]

Given $f'(x) = 6x^2 - 4x$ and $f(1) = 5$, find an expression for $f(x)$.

Question 12

[4 marks]

A curve satisfies $\frac{dy}{dx} = 3x^2 - 12x + 5$ and passes through $(2, 7)$. Find its equation.

Question 13

[4 marks]

Evaluate $\int_0^1 (2x + 1)^3 \, dx$.

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Question 14

[3 marks]

Given $\int_0^a 2x\,dx = 25$, where $a > 0$, find a.

SECTION C | Exam-style and challenge

Question 15

[4 marks]

Given $\int_1^a 3x^2\,dx = 7$, where $a > 1$, find a.

Question 16

[4 marks]

Find $\int \left(\sqrt{x} - \frac{2}{\sqrt{x}}\right) dx$, where $x > 0$.

Question 17

[6 marks]

Given $f''(x) = 12x - 6$, $f'(0) = 4$ and $f(0) = -1$, find $f(x)$.

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Question 18

[4 marks]

Evaluate exactly $\int_0^{\frac{\pi}{2}} (2\sin x + \cos x)\, dx$.

— End of pupil worksheet —

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