

Integrals — Assignment 2

Class 12 Maths · Higher-difficulty challenge set + integrated problems · Answer key included · Narayan Gurukul Academy

Instructions: (1) Attempt all questions; start with the topic-wise challenge set, then attempt the integrated (multi-topic) problems.
(2) Give all answers with correct SI units. $g = 10 \text{ m/s}^2$ unless stated.
(3) A final answer key is provided at the end — try the full set before checking it.

Part A — Topic-wise challenge questions

Indefinite Integrals and Standard Forms

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

Substitution and Partial Fractions

1. Evaluate $\int 2x/(x^2 + 1) dx$.
2. Evaluate $\int (2x + 1)/(x^2 + x + 1) dx$.
3. Evaluate $\int 1/(x^2 - 1) dx$ using partial fractions.

Integration by Parts

1. Evaluate $\int x \cos x dx$.
2. Evaluate $\int \log x dx$.
3. Evaluate $\int x^2 e^x dx$.

Definite Integrals and the Fundamental Theorem

1. Evaluate $\int_0^1 x^2 dx$.
2. Evaluate $\int_0^{\pi/2} \cos x dx$.
3. Evaluate $\int_1^2 (x^2 + 1) dx$.

Part B — Integrated problems (multi-topic)

1. Evaluate $\int (x^2 + 1) dx$.
2. Evaluate $\int 2x/(x^2 + 1) dx$.
3. Evaluate $\int x \cos x dx$.
4. Evaluate $\int_0^1 x^2 dx$.
5. Evaluate $\int_0^{\pi/2} \cos x dx$.

Answer Key

Indefinite Integrals and Standard Forms

$$x^3/3 + x + C, x^3 + x^2 + C, x^4/4 + x^2 + x + C.$$

Substitution and Partial Fractions

$$\log(x^2 + 1) + C. \log(x^2 + x + 1) + C. (1/2) \log |(x - 1)/(x + 1)| + C.$$

Integration by Parts

$$x \sin x + \cos x + C. x \log x - x + C. e^x(x^2 - 2x + 2) + C.$$

Definite Integrals and the Fundamental Theorem

$$1/3. 1. 10/3.$$

Integrated problems

$$1: x^3/3 + x + C. 2: \log(x^2 + 1) + C. 3: x \sin x + \cos x + C. 4: 1/3. 5: 1.$$