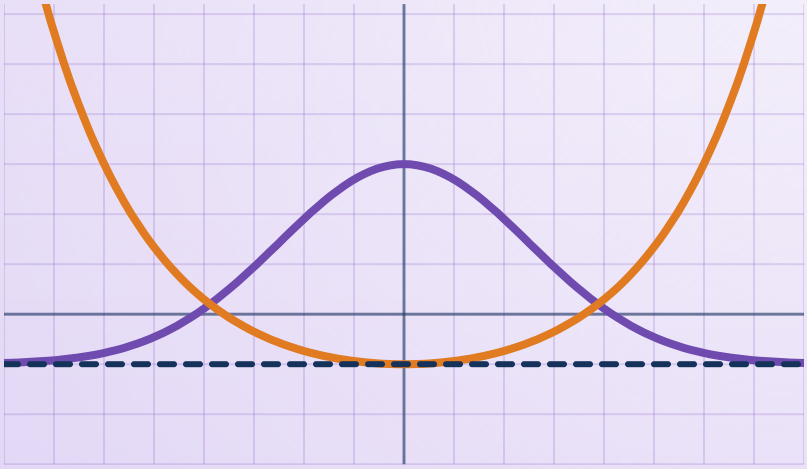
KECUDO

2026 EDITION · COLLEGE MATH SERIES



CALCULUS II

Class C1

Integration Techniques

A toolkit for every integral

PREMIUM EDITION · KECUDO · C1

13 CHAPTERS · 120 SELF-ASSESSMENT QUESTIONS

INTERACTIVE EDITION + PRINT PDF

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FOUNDATION

Chapter 1

Review: Basic Integrals & u-Substitution

Every technique in this book reduces a hard integral to the basic table from Calculus I. Know it cold.

$\int f(x)\,dx$	Result	$\int f(x)\,dx$	Result
x^n $(n \neq -1)$	$x^{n+1}/(n+1)$	$\sec^2 x$	$\tan x$
$1/x$	$\ln\|x\|$	$\sec x \tan x$	$\sec x$
e^x	e^x	$1/(1+x^2)$	$\tan^{-1} x$
a^x	$a^x / \ln a$	$1/\sqrt{1-x^2}$	$\sin^{-1} x$
$\sin x$	$-\cos x$	$\tan x$	$\ln\|\sec x\|$
$\cos x$	$\sin x$	$\sec x$	$\ln\|\sec x + \tan x\|$

Every answer above gets $+ C$.

WORKED EXAMPLE **u-substitution warm-ups**

1. $\int x\sqrt{x^2+4}\,dx$: $u = x^2 + 4$ gives $(1/3)(x^2+4)^{3/2} + C$.
2. $\int \ln x / x\,dx$: $u = \ln x$ gives $(\ln x)^2/2 + C$.
3. $\int e^x/(1+e^{2x})\,dx$: $u = e^x$ gives $\tan^{-1}(e^x) + C$.

✓ **Spot an inside function whose derivative is also present**

KEY IDEA

Before any fancy technique, try algebra (expand, split, simplify) and a substitution. They solve more integrals than anything else.

FOUNDATION

Chapter 2

Integration by Parts

$$\int u\,dv = uv - \int v\,du$$

It is the product rule run backward. Choose u so that du is simpler, and dv so that you can integrate it.

CHOOSING U: LIATE

Pick u from the first type that appears: **L**ogarithmic, **I**nverse trig, **A**lgebraic (powers of x), **T**rig, **E**xponential.

WORKED EXAMPLE $\int x\,e^x\,dx$

1. $u = x$, $dv = e^x\,dx$; so $du = dx$, $v = e^x$.
2. $x\,e^x - \int e^x\,dx$.

✓ $(x-1)e^x + C$

WORKED EXAMPLE $\int \ln x\,dx$

1. $u = \ln x$, $dv = dx$; $du = dx/x$, $v = x$.
2. $x \ln x - \int 1\,dx$.

✓ $x \ln x - x + C$

WORKED EXAMPLE $\int_0^{\pi} x \sin x\,dx$

1. $u = x$, $dv = \sin x\,dx$: $-x\cos x + \int \cos x\,dx = -x\cos x + \sin x$.
2. $[-x\cos x + \sin x]_0^{\pi} = \pi$.

✓ π

CHECK YOUR UNDERSTANDING

Chapter 1: Review: Basic Integrals & u-Substitution

5 questions · your answer locks when you choose it

1. What is $\int \sec x \tan x \, dx$?

- **A** $\ln|\sec x| + C$
- **B** $\sec^2 x + C$
- **C** $\sec x + C$
- **D** $\tan x + C$

2. What is $\int 1/(1 + x^2) \, dx$?

- **A** $\tan^{-1} x + C$
- **B** $\sin^{-1} x + C$
- **C** $\ln(1 + x^2) + C$
- **D** $1/x + C$

3. What is $\int \ln x / x \, dx$?

- **A** $\ln(\ln x) + C$
- **B** $(\ln x)^2/2 + C$
- **C** $x \ln x + C$
- **D** $1/x^2 + C$

4. What is $\int \tan x \, dx$?

- **A** $\ln|\sec x| + C$
- **B** $\sec^2 x + C$
- **C** $\ln|\cos x| + C$
- **D** $\tan^2 x/2 + C$

5. What is $\int 2^x \, dx$?

- **A** $2^x / \ln 2 + C$
- **B** $2^{x+1}/(x + 1) + C$
- **C** $2^x \ln 2 + C$
- **D** $x \, 2^{x-1} + C$

FINAL EXAM

25 Questions on the Whole Book

Parts A–E · 5 questions each

Part A · Basics

1. Integration by parts is based on:

A the product rule
B the quotient rule
C the power rule
D the chain rule

2. For $\sqrt{(a^2 + x^2)}$, the trig substitution is:

A $x = a \sec \theta$
B $x = a \cos \theta$
C $x = a \sin \theta$
D $x = a \tan \theta$

3. Partial fractions apply to:

A roots
B trig powers
C rational functions
D exponentials

4. An improper integral converges when:

A its limit is finite
B its interval is finite
C its integrand is positive
D it has no asymptote

5. Simpson's Rule needs:

A an odd number
B an even number of subintervals
C no data
D exactly 4



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Thank you for learning with Kecudo.

NEXT IN THE SERIES

Class C2 · Applications of Integration