

**Dr.SNS RAJALAKSHMI COLLEGE OF ARTS AND SCIENCE  
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Coimbatore- 49**



**DEPARTMENT OF MATHEMATICS**

**21UCR304: BUSINESS CALCULUS AND FINANCIAL  
COMPUTATION**

**LIMITS OF ALGEBRAIC FUNCTIONS**

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# What is Substitution Method?

- A technique used to simplify an integral
- Replaces a part of the expression with a new variable
- Converts a difficult integral into an easier form
- Works similar to “replacing variables” in algebra

Use substitution when:

- You see a function inside another function
- There is a complicated expression repeated
- Simplifying makes the integral easier
- You want to reduce power or complexity

Examples:

- Expressions with roots
- Complex polynomials
- Composite functions

# Problem

$$\int (3x^2)(x^3 + 4)^5 dx$$

**Solution:**

**Step 1: Let**

$$u = x^3 + 4$$

**Step 2: Differentiate:**

$$du = 3x^2 dx$$

**Step 3: Replace:**

$$\int (3x^2)(x^3 + 4)^5 dx = \int u^5 du$$

**Step 4: Integrate:**

$$\int u^5 du = \frac{u^6}{6} + C$$

**Step 5: Substitute back:**

$$\frac{(x^3 + 4)^6}{6} + C$$

# Problem

$$\int \frac{1}{x \ln x} dx$$

**Solution:**

**Step 1: Let**

$$u = \ln x$$

**Step 2: Differentiate:**

$$du = \frac{1}{x} dx$$

**Step 3: Replace:**

$$\int \frac{1}{x \ln x} dx = \int \frac{1}{u} du$$

**Step 4: Integrate:**

$$\int \frac{1}{u} du = \ln u + C$$

**Step 5: Substitute back:**

$$\ln(\ln x) + C$$

THANK YOU