

## Integration Techniques Quiz PDF

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**What is the integral of a constant  $c$  with respect to  $x$ ?**

- $cx + C$
- $c^x + C$
- $\ln|c| + C$
- $x^c + C$

**Discuss the role of partial fraction decomposition in integration and provide an example of its application.**

**How does trigonometric substitution simplify the integration of certain functions? Provide an example.**

**Explain the relationship between the Gamma function and factorials, and how it is used in integration.**

Select the correct properties of definite integrals:

- $\int [a, b] f(x) dx = -\int [b, a] f(x) dx$
- $\int [a, a] f(x) dx = 0$
- $\int [a, b] [f(x) + g(x)] dx = \int [a, b] f(x) dx + \int [a, b] g(x) dx$
- $\int [a, b] cf(x) dx = c \int [a, b] f(x) dx$ , where  $c$  is a constant

What are improper integrals, and how do you determine their convergence or divergence?

Which of the following integrals require trigonometric substitution?

- $\int \sqrt{1 - x^2} dx$
- $\int \sqrt{x^2 - 1} dx$
- $\int \sqrt{1 + x^2} dx$
- $\int x^2 dx$

Explain the Fundamental Theorem of Calculus and its significance in evaluating definite integrals.

Which of the following are correct applications of the substitution method?

- $\int (2x)(x^2 + 1)^5 dx$ ,  $u = x^2 + 1$
- $\int e^{(3x)} dx$ ,  $u = 3x$
- $\int (x^2 + 1) dx$ ,  $u = x^2 + 1$
- $\int \cos(x) dx$ ,  $u = \sin(x)$

Which substitution would you use for the integral  $\int \sqrt{1-x^2} dx$ ?

- $x = \sin(\theta)$
- $x = \tan(\theta)$
- $x = \cos(\theta)$
- $x = \sec(\theta)$

The integral  $\int (1/x) dx$  results in which of the following?

- $x + C$
- $\ln|x| + C$
- $1/x + C$
- $e^x + C$

What is the result of  $\int \sin^2(x) dx$ ?

- $(1/2)x - (1/4)\sin(2x) + C$
- $(1/2)x + (1/4)\sin(2x) + C$
- $-\cos(x) + C$
- $x^2 + C$

Which of the following are trigonometric identities useful for integration?

- $\sin^2(x) + \cos^2(x) = 1$
- $\tan^2(x) + 1 = \sec^2(x)$
- $\sin(2x) = 2\sin(x)\cos(x)$
- $\cos^2(x) = 1 - \sin^2(x)$

Which technique is most suitable for integrating  $\int x \cos(x) dx$ ?

- Substitution
- Integration by Parts
- Partial Fractions

- Trigonometric Substitution

**Identify the correct integration by parts formula applications:**

- $\int x e^x dx$ ,  $u = x$ ,  $dv = e^x dx$   
  $\int \ln(x) dx$ ,  $u = \ln(x)$ ,  $dv = dx$   
  $\int x^2 dx$ ,  $u = x^2$ ,  $dv = dx$   
  $\int \sin(x) \cos(x) dx$ ,  $u = \sin(x)$ ,  $dv = \cos(x) dx$

**Which of the following is an improper integral?**

- $\int [0, 1] x dx$   
  $\int [1, \infty) (1/x^2) dx$   
  $\int [0, \pi] \sin(x) dx$   
  $\int [0, 1] e^x dx$

**Which of the following is the correct formula for the power rule of integration?**

- $\int x^n dx = nx^{(n-1)} + C$   
  $\int x^n dx = (x^{(n+1)})/(n+1) + C$   
  $\int x^n dx = x^n + C$   
  $\int x^n dx = (n+1)x^n + C$

**Describe the process of using integration by parts and provide an example where this technique is necessary.**

**What is the integral of  $e^x$  with respect to  $x$ ?**

- $e^x + C$   
  $xe^x + C$   
  $\ln|x| + C$   
  $x^e + C$

**Which integrals can be solved using partial fraction decomposition?**

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

$\int (2x + 3)/(x^2 - 1) dx$

$\int (x^2 + 1) dx$

$\int (x^3 + 2x)/(x^2 - 1) dx$