Integration by Parts Quiz Answer Key PDF

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Which functions are often chosen as \(u \) in integration by parts?

A. \(\ln(x) \) ✓

B. \(x^2 \) ✓

C. \(e^x \)

D. \(\sin(x) \)

Explain the derivation of the integration by parts formula from the product rule for differentiation.

Starting from the product rule, we have d(uv)/dx = u(dv/dx) + v(du/dx). Integrating both sides gives ∫(u dv) = uv - ∫(v du), leading to the integration by parts formula: ∫u dv = uv - ∫v du.

Explain how integration by parts can be applied to definite integrals and the importance of applying limits correctly.

To apply integration by parts to definite integrals, you first identify parts of the integrand as u and dv, then compute du and v. After applying the integration by parts formula, you evaluate the resulting expression at the upper and lower limits of integration, ensuring that the limits are applied correctly to avoid errors in the final result.

Discuss the importance of verifying integration by parts results through differentiation.

The importance of verifying integration by parts results through differentiation lies in confirming that the integrated function, when differentiated, returns to the original integrand, thus ensuring the correctness of the integration.

What is the result of differentiating \(uv \) in the integration by parts formula?

A. \(u'v + uv' \) ✓

B. \(uv' - u'v \)

C. \(u'v - uv' \)

D. \(uv + u'v' \)

In the integral \(\int x e^x \, dx\), which function is typically chosen as \(u \)?

A. \(e^x \)
B. \(x \) ✓
C. \(dx \)
D. \(\ln(x) \)

What is the integral of \(e^x \) with respect to \(x \)?

A. \(e^x + C \) ✓
B. \(x e^x + C \)
C. \(\ln(x) + C \)
D. \(x^2 + C \)

Which of the following functions are typically involved in integration by parts?

A. Exponential functions ✓
B. Logarithmic functions ✓
C. Polynomial functions ✓
D. Trigonometric functions ✓

In the integration by parts formula, which part is integrated?

A. \(u \)
B. \(dv \) ✓
C. \(du \)
D. \(v \)

How would you approach solving the integral \(\int x \cos(x) \, dx\) using integration by parts?

Let \(u = x\) and \(dv = \cos(x) \, dx\). Then, \(du = dx\) and \(v = \sin(x)\). Applying integration by parts: \(\int x \cos(x) \, dx = x \sin(x) - \int \sin(x) \, dx = x \sin(x) + \cos(x) + C\).

Which of the following integrals might require multiple applications of integration by parts?

A. \(\int x^2 e^x \, dx\) ✓

B. \(\int \ln(x) \, dx\)

C. \(\int e^x \sin(x) \, dx\) ✓

D. \(\int x \, dx\)

Describe a situation where the LIATE rule might not be the best choice for selecting \(u \) in integration by parts.

For example, in the integral \(\int x e^x \, dx \), while LIATE suggests choosing \(u = x \) and \(dv = e^x \, dx \), this choice leads to a more complicated integral. A better choice might be to let \(u = e^x \) and \(dv = x \, dx \), which simplifies the integration process.

What is the formula for integration by parts?

A. \(\int u \, dv = uv + \int v \, du\)

B. \(\int u \, dv = uv - \int v \, du\) ✓

C. \(\int u \, dv = \int v \, du - uv\)

D. \(\int u \, dv = uv \cdot \int v \, du\)

What is the derivative of \(\ln(x) \), often used in integration by parts?

A. \(x \)

B. \(\frac{1}{x} \) ✓

C. \(e^x \)

D. \(\ln(x) \)

What strategies can be used to handle integrals that require multiple applications of integration by parts?

1. Choose u and dv wisely to simplify the integral in each step. 2. Look for patterns or repetitions in the resulting integrals that can lead to a recursive relationship. 3. If applicable, use tabular integration for efficiency.

What are common errors to avoid in integration by parts?

A. Incorrect choice of \(u \) and \(dv \) ✓

B. Forgetting to subtract the integral of \(v \, du \) ✓

C. Applying the formula to indefinite integrals only

D. Not verifying results by differentiation ✓

Which rule is commonly used to choose \(u \) in integration by parts?

A. FOIL
B. LIATE ✓
C. SOHCAHTOA
D. PEMDAS

Which of the following is a common mistake in applying integration by parts?

A. Choosing \(dv \) as a constant
B. Forgetting to apply limits in definite integrals ✓
C. Differentiating \(u \) instead of integrating
D. All of the above

When applying integration by parts, which of the following are important considerations?

A. Simplifying the integral ✓
B. Choosing \(u \) such that \(du \) is simpler ✓
C. Applying limits correctly in definite integrals ✓
D. Ensuring \(dv \) is easily integrable ✓

Which steps are involved in verifying the result of integration by parts?

A. Differentiating the result to check the original integrand ✓
B. Using substitution to confirm the result
C. Checking for sign errors ✓
D. Reapplying integration by parts to verify