

JEE MAIN INTEGRATION PRACTICE TEST (SAMPLE)

STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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THE FULL VERSION STUDY GUIDE

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

- Practice answering questions under realistic conditions,
- Improve accuracy and speed,
- Review explanations to strengthen weak areas, and
- Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 – 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

Questions

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1. What is the integral of $\tan(x)$ dx?

- A. $-\ln|\cos(x)| + C$
- B. $\ln|\sin(x)| + C$
- C. $\ln|\tan(x)| + C$
- D. $-\ln|\sin(x)| + C$

2. Calculate $\int (\tan(x))^2 dx$.

- A. $\tan(x) - x + C$
- B. $2\tan(x) + C$
- C. $\ln|\sec(x)| + C$
- D. $\sec(x) + C$

3. What concept describes the definite integral as the limit of a sum?

- A. Integration by parts
- B. Riemann Sum
- C. Absolute Convergence
- D. Monte Carlo Method

4. What does the ILATE Rule help with in integration?

- A. Guiding choices for substitution
- B. Identifying limits of integration
- C. Selecting functions in Integration by Parts
- D. Estimating the area under curves

5. Evaluate $\int x^4 dx$.

- A. $(1/5)x^5 + C$
- B. $(1/4)x^4 + C$
- C. $(1/3)x^3 + C$
- D. $(1/2)x^2 + C$

6. What is the integral of the constant 7 with respect to x?

- A. $7x + C$
- B. $7/x + C$
- C. $7 + C$
- D. $\ln(7x) + C$

7. Evaluate $\int (2x)e^{(x^2)} dx$ using substitution. What is the result?

- A. $e^{(x^2)} + C$
- B. $e^{(2x)} + C$
- C. $2e^{(x^2)} + C$
- D. $e^{(x^2/2)} + C$

8. What is the derivative of $\ln(x)$ with respect to x ?

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

9. What is the purpose of substitution in integration?

- A. To change the limits of the integral
- B. To replace variables to simplify calculations
- C. To integrate more easily using a calculator
- D. To convert integrals into simpler algebraic forms

10. What is the formula for integrating $(x^n) dx$?

- A. $(x^{(n+1)})/(n+1) + C$
- B. $(n/(x^{(n-1)})) + C$
- C. $(n^2 x^n)/2 + C$
- D. $x^n + C$

Answers

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1. A
2. A
3. B
4. C
5. A
6. A
7. A
8. A
9. B
10. A

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Explanations

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1. What is the integral of $\tan(x) \, dx$?

- A. $-\ln|\cos(x)| + C$
- B. $\ln|\sin(x)| + C$
- C. $\ln|\tan(x)| + C$
- D. $-\ln|\sin(x)| + C$

To find the integral of $\tan(x) \, dx$, we can use the relationship between tangent and sine and cosine. Recall that $\tan(x) = \frac{\sin(x)}{\cos(x)}$. To integrate $\tan(x)$, we can rewrite it as: $\int \tan(x) \, dx = \int \frac{\sin(x)}{\cos(x)} \, dx$. A common method to integrate this function is to use substitution. Let $u = \cos(x)$. Then, the derivative of u with respect to x is $du = -\sin(x) \, dx$, which implies that $dx = -\frac{du}{\sin(x)}$. Substituting these into the integral, we can write: $\int \tan(x) \, dx = -\int \frac{1}{u} \, du$. The integral of $\frac{1}{u}$ is $\ln|u| + C$, leading us to: $-\ln|u| + C = -\ln|\cos(x)| + C$. Thus, the integral of $\tan(x) \, dx$ is $-\ln|\cos(x)| + C$.

2. Calculate $\int (\tan(x))^2 \, dx$.

- A. $\tan(x) - x + C$
- B. $2\tan(x) + C$
- C. $\ln|\sec(x)| + C$
- D. $\sec(x) + C$

To calculate the integral of $(\tan(x))^2$, we can use a fundamental identity from trigonometry: $\tan^2(x) = \sec^2(x) - 1$. By substituting this identity into the integral, we have: $\int \tan^2(x) \, dx = \int (\sec^2(x) - 1) \, dx$. This can be split into two separate integrals: $\int \tan^2(x) \, dx = \int \sec^2(x) \, dx - \int 1 \, dx$. The integral of $\sec^2(x)$ is a well-known result: $\int \sec^2(x) \, dx = \tan(x)$. On the other hand, the integral of 1 with respect to x is simply: $\int 1 \, dx = x$. Combining these results gives: $\int \tan^2(x) \, dx = \tan(x) - x + C$, where C is the constant.

3. What concept describes the definite integral as the limit of a sum?

- A. Integration by parts
- B. Riemann Sum
- C. Absolute Convergence
- D. Monte Carlo Method

The concept that describes the definite integral as the limit of a sum is the Riemann Sum. This approach is foundational in understanding how integration is defined in calculus. Riemann Sums break down the area under a curve into a finite number of rectangles, each representing a segment of the area. As the number of rectangles increases (and their width decreases), this sum approaches a precise value, known as the definite integral. Formally, if a function is continuous on a closed interval, the limit of the Riemann Sum as the number of rectangles approaches infinity yields the exact value of the definite integral. This concept is crucial for understanding the approximation of areas under curves and serves as the basis for many numerical integration techniques. Using Riemann Sums allows students to visualize integration as an accumulation of infinitesimally small quantities, bridging the gap between discrete and continuous mathematics.

4. What does the ILATE Rule help with in integration?

- A. Guiding choices for substitution
- B. Identifying limits of integration
- C. Selecting functions in Integration by Parts**
- D. Estimating the area under curves

The ILATE Rule is a mnemonic device used to help select which function to differentiate and which to integrate when applying the technique of Integration by Parts. This rule suggests a priority order for choosing functions based on the acronym itself: - I: Inverse Trigonometric Functions (e.g., $\arcsin$, $\arccos$) - L: Logarithmic Functions (e.g., $\ln(x)$) - A: Algebraic Functions (e.g., polynomials like x^2) - T: Trigonometric Functions (e.g., $\sin(x)$, $\cos(x)$) - E: Exponential Functions (e.g., e^x) When faced with the task of integrating a product of functions, following the ILATE hierarchy can make the integration process more manageable. By selecting the function from this priority list as the one to differentiate (the "u" in the integration by parts formula), you are typically able to simplify the integral more efficiently. While the other options touch on important aspects of integration, they do not directly relate to the purpose of the ILATE Rule. For instance, the concept of substitution involves a different technique in integration. Identifying limits of integration pertains to definite integrals, and estimating area under curves is more aligned with numerical methods or geometric

5. Evaluate $\int x^4 dx$.

- A. $(1/5)x^5 + C$**
- B. $(1/4)x^4 + C$
- C. $(1/3)x^3 + C$
- D. $(1/2)x^2 + C$

To evaluate the integral $\int x^4 dx$, we apply the power rule for integration. According to this rule, when integrating a term of the form x^n , where n is any real number, the integral is given by: $\int x^n dx = (1/(n+1)) x^{(n+1)} + C$, where C is the constant of integration. In this case, n is 4. Thus, we will calculate: 1. Increase the exponent by 1, which gives us $n + 1 = 4 + 1 = 5$. 2. Divide by this new exponent (5) to get $(1/5)$. 3. Multiply by x raised to the new exponent: $(1/5)x^5$. Putting it all together, the result of the integral is: $\int x^4 dx = (1/5)x^5 + C$. This confirms that the correct choice is indeed $(1/5)x^5 + C$. The other given choices represent integrals of different functions and thus do not align with the integral of x^4 .

6. What is the integral of the constant 7 with respect to x ?

- A. $7x + C$**
- B. $7/x + C$
- C. $7 + C$
- D. $\ln(7x) + C$

The integral of a constant can be determined using the basic principle of integration. When you integrate a constant 'k' with respect to a variable 'x', the result is k times the variable, plus a constant of integration, typically denoted as C. In this case, since the constant is 7, the integral can be calculated as follows: $\int 7 dx = 7x + C$ This matches the correct answer, as it captures the essence of integrating a constant by multiplying it by the variable (x) and adding the constant of integration (C). The other options present alternative forms that do not correspond to the process of integrating a constant with respect to x. For instance, the second option suggests a division by x, which is not relevant in this context. The third option merely adds a constant to 7 without involving x, while the fourth option introduces a natural logarithm, which is entirely unrelated to the integration of a constant. Thus, the first option accurately reflects the correct method of integrating a constant, making it the right choice.

7. Evaluate $\int (2x)e^{(x^2)} dx$ using substitution. What is the result?

- A. $e^{(x^2)} + C$
- B. $e^{(2x)} + C$
- C. $2e^{(x^2)} + C$
- D. $e^{(x^2/2)} + C$

To evaluate the integral $\int (2x)e^{(x^2)} dx$, a suitable substitution is to let $(u = x^2)$. This leads to $(du = 2x \, dx)$. Consequently, the integral can be rewritten in terms of (u) : $\int (2x) e^{(x^2)} \, dx = \int e^u \, du$. The integral of (e^u) is simply $(e^u + C)$. Substituting back $(u = x^2)$ gives: $e^{(x^2)} + C$. Hence, this matches choice A. This choice is confirmed as the final result of the integral. The chosen substitution effectively transformed the original integral into a standard form that is well-known, leading directly to the correct answer. This realization highlights the power of substitution techniques in integration, allowing the transformation of complex integrals into simpler forms that are easier to evaluate. The connection between (x) and (u) is crucial for successfully applying this method.

8. What is the derivative of $\ln(x)$ with respect to x ?

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

The derivative of the natural logarithm function, $\ln(x)$, with respect to x is $1/x$. This result is derived from the rules of calculus, specifically utilizing the concept of limits and the definition of a derivative. To understand why this is the case, we can start from the definition of the derivative, which is the limit of the difference quotient: $\frac{d}{dx} \ln(x) = \lim_{h \rightarrow 0} \frac{\ln(x+h) - \ln(x)}{h}$. Using the properties of logarithms, we can rewrite the difference of logarithms: $\ln(x+h) - \ln(x) = \ln\left(\frac{x+h}{x}\right) = \ln\left(1 + \frac{h}{x}\right)$. As (h) approaches 0, we can apply the Taylor series expansion or the property that $\ln(1+u) \approx u$ when (u) is small. Therefore, we can simplify it further: $\lim_{h \rightarrow 0} \frac{\ln\left(1 + \frac{h}{x}\right)}{h}$.

9. What is the purpose of substitution in integration?

- A. To change the limits of the integral
- B. To replace variables to simplify calculations
- C. To integrate more easily using a calculator
- D. To convert integrals into simpler algebraic forms

Substitution in integration is primarily utilized to replace variables in the integral with new variables or expressions that simplify the integration process. This technique focuses on identifying a part of the integrand that can be substituted with a single variable, which often results in a simpler integral that is easier to solve. For instance, if you have an integral that contains a composite function, substituting the inner function can reduce the complexity of the integral, making it possible to solve it using basic integration rules. Essentially, this process not only streamlines the computation but also helps in identifying integrals that might be difficult to tackle in their original form. While changing the limits can be a part of the substitution process when dealing with definite integrals, the primary aim of substitution is simplification rather than limit adjustment. The option about using a calculator may relate to computational efficiency, but that is not the core purpose of substitution. Similarly, converting integrals into simpler algebraic forms is a consequence of substitution rather than its primary objective. Thus, the emphasis on simplifying calculations directly aligns with the purpose of substitution in integration.

10. What is the formula for integrating $(x^n) dx$?

A. $\frac{(x^{n+1})}{(n+1)} + C$

B. $(n/(x^{n-1})) + C$

C. $(n^2 x^n)/2 + C$

D. $x^n + C$

The integration of a function of the form (x^n) is a fundamental concept in calculus, particularly in the context of definite and indefinite integrals. The correct formula for integrating (x^n) with respect to (x) is derived using the power rule for integration. According to the power rule, if (n) is not equal to -1 , the integral of (x^n) dx is calculated by increasing the exponent by 1 and dividing by the new exponent. This gives us: $\int x^n dx = \frac{x^{n+1}}{n+1} + C$ Where (C) is the constant of integration. This formula applies directly when the exponent (n) is anything except -1 . If $(n = -1)$, integrating (x^{-1}) leads to the natural logarithm function. This understanding helps in solving a wide variety of problems in calculus, including finding the area under curves and solving differential equations. Familiarity with this rule is essential for further studies in mathematics and physics as well. The other choices do not follow the established power rule for integration. The approach in those responses either misap

Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at hello@examzify.com.

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We wish you the very best on your exam journey. You've got this!

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