JEE Main Integration Practice Test (Sample)

Study Guide

Everything you need from our exam experts!

Notice: Examzify makes every reasonable effort to obtain accurate, complete, and timely information about this product from reliable sources.

Table of Contents

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

1. **What is the primary focus of the introduction to integration?**
   - A. The rigorous definitions of integrals
   - B. The applications of integration in real-life scenarios
   - C. The history of integration techniques
   - D. The general concept of integration as a mathematical operation

2. **How do you find the integral of a trigonometric function like sin(x)?**
   - A. Use the antiderivative associated with it.
   - B. Find its derivative first.
   - C. Use logarithmic properties.
   - D. Use exponential identities.

3. **What is the result of integrating cos^3(x) with respect to x?**
   - A. (3/4)sin(x) + (1/4)sin^3(x) + C
   - B. (1/3)sin^3(x) + C
   - C. (1/2)sin(x) + (1/2)sin^3(x) + C
   - D. (1/4)sin(x) + (3/4)sin^3(x) + C

4. **What is the result of ∫ sin^2(x) dx?**
   - A. (1/2)(x + sin(2x)/2) + C
   - B. (1/2)(x - (1/2)sin(2x)) + C
   - C. sin(x) + C
   - D. (1/3)(x^3) + C

5. **To evaluate ∫ (1 + x^2)^(1/2) dx, what technique is required?**
   - A. This requires a trigonometric substitution.
   - B. This requires partial fraction decomposition.
   - C. This can be solved by simple integration techniques.
   - D. This requires integration by parts.

6. Find the integral of x e^x dx.

A. e^x (x - 1) + C
B. e^x (x + 1) + C
C. e^x (x^2/2) + C
D. e^x (x^2 - 1) + C

7. How do you integrate e^(kx) where k is a constant?

A. (1/k)e^(kx) + C
B. e^(kx) + C
C. ke^(kx) + C
D. (1/k^2)e^(kx) + C

8. What does the greatest integer function return?

A. The smallest integer greater than a given number
B. The largest integer less than or equal to a given number
C. The smallest integer less than a given number
D. The largest integer greater than a given number

9. Why is integration by parts a useful technique in calculus?

A. It simplifies polynomials.
B. It breaks down complex integrals into simpler parts.
C. It can be used to solve differential equations.
D. It eliminates all logarithmic functions.

10. Why is the concept of an integrand crucial in integration?

A. It determines the shape of the graph of the function
B. It is the variable to be differentiated
C. It is the primary function that undergoes integration
D. It denotes the limits of the integral calculation

Answers

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

Explanations

1. **What is the primary focus of the introduction to integration?**

    A. The rigorous definitions of integrals

    B. The applications of integration in real-life scenarios

    C. The history of integration techniques

    D. The general concept of integration as a mathematical operation

The primary focus of the introduction to integration is on the general concept of integration as a mathematical operation. This foundational aspect lays the groundwork for understanding how integration functions as a tool for calculating areas under curves, the accumulation of quantities, and solving differential equations, among other applications. By grasping the fundamental ideas behind integration, such as the process of summing infinitesimal quantities, students can build upon this knowledge to explore more advanced topics, such as methods of integration, applications in physics and engineering, and the rigorous definitions of integrals. In contrast, the rigorous definitions of integrals, while important, typically follow the initial understanding of what integration means. Likewise, exploring applications and historical context are valuable, but they generally arise after a basic comprehension of integration as a concept has been established. Thus, the emphasis at the introduction stage is on effectively conveying the essence of integration as a mathematical operation.

2. **How do you find the integral of a trigonometric function like sin(x)?**

    A. Use the antiderivative associated with it.

    B. Find its derivative first.

    C. Use logarithmic properties.

    D. Use exponential identities.

To find the integral of a trigonometric function like sin(x), the most effective approach is to use the antiderivative associated with it. The antiderivative of sin(x) is a standard result in integral calculus and is known to be -cos(x) + C, where C is the constant of integration. This is because integration is essentially the reverse process of differentiation, and knowing the derivative of sin(x) helps in identifying the correct antiderivative. The other methods mentioned, such as finding the derivative first, using logarithmic properties, or employing exponential identities, are not applicable to directly integrating a simple function like sin(x). While there are instances where logarithmic and exponential properties can aid in evaluating more complex integrals, they do not apply to the basic integration of sin(x) in a straightforward sense. Therefore, utilizing the known antiderivative is the most appropriate and efficient method for this scenario.

3. What is the result of integrating cos^3(x) with respect to x?

A. (3/4)sin(x) + (1/4)sin^3(x) + C

B. (1/3)sin^3(x) + C

C. (1/2)sin(x) + (1/2)sin^3(x) + C

D. (1/4)sin(x) + (3/4)sin^3(x) + C

To determine the result of integrating \(\cos^3(x) \) with respect to \(x \), we can use a trigonometric identity and integration by substitution. The integral can be expressed as: \[\int \cos^3(x) \, dx \] We can rewrite \(\cos^3(x) \) using the identity \(\cos^2(x) = 1 - \sin^2(x) \): \[\cos^3(x) = \cos(x) \cdot (1 - \sin^2(x)) \] This gives us: \[\int \cos^3(x) \, dx = \int \cos(x) \, dx - \int \cos(x) \sin^2(x) \, dx \] The first part, \(\int \cos(x) \, dx \), results in \(\sin(x) \). For the second part, we use substitution. Let \(u = \sin(x) \), so \(du = \cos(x) \, dx \): \[\int \cos(x) \sin^2(x) \, dx = \int u^2 \, du = \

4. What is the result of ∫ sin^2(x) dx?

A. (1/2)(x + sin(2x)/2) + C

B. (1/2)(x - (1/2)sin(2x)) + C

C. sin(x) + C

D. (1/3)(x^3) + C

To find the integral of $\sin^2(x)$ with respect to x, we can use the identity involving the double angle formula for cosine. The identity states that $\sin^2(x)$ can be rewritten as: \[\sin^2(x) = \frac{1 - \cos(2x)}{2} \] Now, substituting this back into the integral: \[\int \sin^2(x) \, dx = \int \frac{1 - \cos(2x)}{2} \, dx = \frac{1}{2} \int (1 - \cos(2x)) \, dx \] This integral can be separated into two parts: \[\int (1 - \cos(2x)) \, dx = \int 1 \, dx - \int \cos(2x) \, dx \] Calculating each integral separately: 1. The integral of 1 with respect to x is simply x. 2. For the integral of cos(2x), we apply the substitution u = 2x, leading to du = 2dx, or dx = (1/2)du. Thus, \[\int \cos(

5. To evaluate ∫ (1 + x^2)^(1/2) dx, what technique is required?

A. This requires a trigonometric substitution.

B. This requires partial fraction decomposition.

C. This can be solved by simple integration techniques.

D. This requires integration by parts.

The integral ∫ (1 + x^2)^(1/2) dx involves an expression that resembles a form suitable for trigonometric substitution. This technique is often utilized when dealing with integrals that contain square roots of quadratic polynomials, particularly those that can be simplified by substituting \(x = \tan(\theta) \). In this specific case, using the substitution \(x = \tan(\theta) \) transforms the integrand, as follows: - The expression under the square root becomes \(\sqrt{1 + \tan^2(\theta)} \), which simplifies to \(\sec(\theta) \) based on the identity \(1 + \tan^2(\theta) = \sec^2(\theta) \). - Additionally, the derivative \(dx \) changes to \(\sec^2(\theta) d\theta \). Thus, the integral transforms into a form that is much simpler to evaluate. The other techniques mentioned, such as partial fraction decomposition, simple integration techniques, and integration by parts, are not appropriate for this integral due to the nature of the expression involved. Those methods are typically used for rational functions, straightforward polynomial expressions, or products of functions, but

6. Find the integral of x e^x dx.

A. e^x (x - 1) + C

B. e^x (x + 1) + C

C. e^x (x^2/2) + C

D. e^x (x^2 - 1) + C

**To find the integral of \(x e^x \, dx \), we can use the technique of integration by parts. This method is particularly useful when dealing with products of functions, like \(x \) and \(e^x \). We start by letting: - \(u = x \) (which we will differentiate) - \(dv = e^x \, dx \) (which we will integrate) Next, we need to compute \(du \) and \(v \): - Differentiating \(u \) gives us \(du = dx \). - Integrating \(dv \) yields \(v = e^x \). We then apply the integration by parts formula, which states: \[\int u \, dv = uv - \int v \, du \] Substituting our choices into this formula, we have: \[\int x e^x \, dx = x e^x - \int e^x \, dx \] Now, we need to evaluate the integral on the right: \[\int e^x \, dx = e^x \] Substituting this back into our earlier equation, we have: \[**

7. How do you integrate e^(kx) where k is a constant?

A. (1/k)e^(kx) + C

B. e^(kx) + C

C. ke^(kx) + C

D. (1/k^2)e^(kx) + C

Integrating the expression \(e^{kx} \), where \(k \) is a constant, relies on understanding how the exponential function behaves under integration. When you perform the integration of \(e^{kx} \), you apply a basic rule of integration for exponential functions. The standard result for integrating \(e^{ax} \) (where \(a \) is any constant) is \(\frac{1}{a} e^{ax} + C \). In this case, \(a \) is represented by \(k \). Thus, integrating \(e^{kx} \) gives: \[\int e^{kx} \, dx = \frac{1}{k} e^{kx} + C \] Here, \(\frac{1}{k} \) is a scaling factor that arises because of the derivative of the exponent \(kx \). When this function is differentiated, \(k \) is a factor that appears, and hence when you integrate, you need to counteract that by dividing by \(k \). Therefore, the correct integration result, which includes the constant of integration \(C \), is \(\frac{1}{k} e^{kx} + C \). This

8. What does the greatest integer function return?

A. The smallest integer greater than a given number

B. The largest integer less than or equal to a given number

C. The smallest integer less than a given number

D. The largest integer greater than a given number

The greatest integer function, often denoted as ⌊x⌋, returns the largest integer that is less than or equal to a given number x. This means that it rounds down to the nearest whole number. For example, if you have a number like 3.7, the greatest integer function would return 3, since 3 is the largest integer that is less than or equal to 3.7. Similarly, for a number like -2.3, it would return -3, because -3 is the greatest integer that is less than -2.3. This function is especially useful in various mathematical applications, including computer science where it might be used to determine indices or in algorithms that require whole numbers. Understanding how this function behaves with both positive and negative numbers is key to applying this knowledge correctly in mathematical problems.

9. Why is integration by parts a useful technique in calculus?

A. It simplifies polynomials.

B. It breaks down complex integrals into simpler parts.

C. It can be used to solve differential equations.

D. It eliminates all logarithmic functions.

Integration by parts is a valuable technique in calculus primarily because it allows you to break down complex integrals into simpler components. This method is grounded in the product rule for differentiation and is particularly effective when the integral comprises products of functions that are amenable to straightforward differentiation and integration. The formula for integration by parts is derived from this principle and is expressed as $\int u \, dv = u v - \int v \, du$. Here, one identifies parts of the original integral to assign as u and dv, such that differentiating u and integrating dv leads to a new integral that is easier to evaluate. By transforming the original integral into a simpler one or a more manageable form, this technique facilitates the integration of functions that would be otherwise difficult to integrate directly. For example, if you have an integral involving polynomial functions multiplied by trigonometric or exponential functions, integration by parts can simplify the complexity through the breakdown of these product forms, making them easier to handle during integration processes. Using integration by parts does not inherently simplify polynomials but rather offers a means to manage integrals involving combinations of functions. While it has applications in solving certain kinds of differential equations, that is not its primary advantage. Furthermore, it does not eliminate logarithmic functions; instead, it

10. Why is the concept of an integrand crucial in integration?

A. It determines the shape of the graph of the function

B. It is the variable to be differentiated

C. It is the primary function that undergoes integration

D. It denotes the limits of the integral calculation

The concept of an integrand is crucial in integration because it refers specifically to the primary function that is being integrated. The integrand defines the area under the curve that is being calculated, representing the relationship between variables in the context of integration. When setting up an integral, it is essential to identify the integrand correctly since it directly affects the outcome of the integration process. In the context of integration, the integrand is the core function from which we derive geometric or physical interpretations, such as the area, volume, or other quantities. For instance, if the integrand represents a velocity function, integrating it over a specific interval provides the total displacement. While other concepts in integration, such as limits of integration and the process of differentiation, are important, they do not encapsulate the essence of what an integrand is. Understanding the role of the integrand is fundamental to mastering integration techniques and applications in various mathematical and real-world problems.

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.

Or visit your dedicated course page for more study tools and resources:

https://jeemainintegration.examzify.com

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