NCERT Solutions Class 12 Maths
Chapter 7: Integrals
Exercise 7.10

Document Information:
Class: 12 | **Subject:** Mathematics | **Chapter:** 7 | **Exercise:** 7.10
Total Questions: 21 | **Academic Year:** 2025-26
Source: www.ncertbooks.net | **Generated:** February 21, 2026

Quick Summary: In NCERT Solutions Class 12 Maths Chapter 7 Exercise 7.10, students learn to evaluate definite integrals using the Fundamental Theorem of Calculus and integration by parts. This exercise covers challenging problems involving trigonometric functions, absolute value functions, and special limits from 0 to π/2, which are essential for mastering integration techniques required in CBSE board exams and competitive tests.

Key Takeaways:

- Master the Fundamental Theorem of Calculus: \int_a^b f(x)dx = F(b) - F(a) where F'(x) = f(x)
- Apply integration by parts formula \int u \, dv = uv - \int v \, du for products of functions
- Handle absolute value functions by splitting integrals at points where the expression changes sign
- Use symmetry properties and special limits like 0 to π/2 to simplify trigonometric integrals efficiently

Complete Solutions

Question 1

QUESTION

Evaluate \int_0^π/2 \cos^2 x\,dx.

SOLUTION

We need to evaluate the definite integral .

Step 1: Use the trigonometric identity to simplify the integrand

We know the trigonometric identity: . We can rearrange this to express in terms of :

Step 2: Substitute the simplified expression into the integral

Now we substitute this into our integral:

Step 3: Split the integral into two parts

We can split the integral into two separate integrals:

Step 4: Evaluate the first integral

Step 5: Evaluate the second integral

Step 6: Combine the results

Now we substitute these results back into our expression:

Final Answer:

ANSWER

(π)/(4)

Question 2

QUESTION

Evaluate \int_0^π/2 √\sin x√\sin x+√\cos x\,dx.

SOLUTION

We need to evaluate the definite integral . This question tests our understanding of definite integrals and the application of properties to simplify them.

Step 1: Define the integral

Let . We will use the property of definite integrals that states .

Step 2: Apply the property

Applying this property, we get:

Since and , we have:

Step 3: Add the two forms of the integral

Adding the original integral and the transformed integral, we get:

Step 4: Evaluate the integral

Now we can easily evaluate the integral:

Step 5: Solve for I

Dividing both sides by 2, we get:

Therefore, the value of the integral is .

ANSWER

(π)/(4)

Question 3

QUESTION

Evaluate \int_0^π/2 \sin^3/2 x\sin^3/2 x+\cos^3/2 x\,dx.

SOLUTION

We need to evaluate the definite integral . This question tests our understanding of definite integrals and the properties associated with them.

Step 1: Define the integral

Let . We will use the property of definite integrals that states .

Step 2: Apply the property

Applying this property, we get:

Since and , we can rewrite the integral as:

Step 3: Add the two forms of the integral

Now, we add the original integral and the transformed integral:

Step 4: Simplify and evaluate

The integrand simplifies to 1:

Step 5: Solve for I

Finally, we solve for :

Therefore, the value of the integral is .

ANSWER

(π)/(4)

Question 4

QUESTION

Evaluate \int_0^π/2 \cos^5 x\sin^5 x+\cos^5 x\,dx.

SOLUTION

We need to evaluate the definite integral . This question tests our understanding of definite integrals and the application of properties to simplify them.

Step 1: Define the integral

Let . We will use the property of definite integrals: .

Step 2: Apply the property

Applying the property, we get:

Since and , we have:

Step 3: Add the original and transformed integrals

Adding the original integral and the transformed integral, we get:

Step 4: Evaluate the simplified integral

Step 5: Solve for I

Final Answer:

Therefore, .

ANSWER

(π)/(4)

Question 5

QUESTION

Evaluate \int_-5^5 |x+2|\,dx.

SOLUTION

We need to evaluate the definite integral of the absolute value function from -5 to 5.

Step 1: Understand the absolute value function

The absolute value function is defined as:

Step 2: Split the integral based on the definition of the absolute value

Since the definition of changes at , we split the integral at this point:

Step 3: Evaluate the first integral

Step 4: Evaluate the second integral

Step 5: Add the two results

Final Answer: The value of the integral is .

ANSWER

29

Question 6

QUESTION

Evaluate \int_2^8 |x-5|\,dx.

SOLUTION

We need to evaluate the definite integral of the absolute value function from 2 to 8.

Step 1: Understand the absolute value function

The absolute value function is defined as:

Step 2: Split the integral

Since the definition of changes at , we split the integral into two parts:

Step 3: Evaluate the first integral

Step 4: Evaluate the second integral

Step 5: Add the two results

Final Answer: The value of the integral is .

ANSWER

9

Question 7

QUESTION

Evaluate \int_0^1 x(1-x)^n\,dx.

SOLUTION

We need to evaluate the definite integral .

Step 1: Use substitution

Let . Then, and . When , , and when , . Therefore, the integral becomes:

Step 2: Change the limits of integration and simplify

We can change the limits of integration by flipping the sign:

Expanding the integrand:

Step 3: Integrate term by term

Now, we integrate each term separately:

Using the power rule for integration, :

Step 4: Combine the results

Substitute these results back into the original expression:

Find a common denominator and simplify:

Final Answer:

ANSWER

(1)/((n+1)(n+2))

Question 8

QUESTION

Evaluate \int_0^π/4 \log(1+\tan x)\,dx.

SOLUTION

We need to evaluate the definite integral . This question tests our knowledge of definite integrals and properties of logarithms and trigonometric functions.

Step 1: Define the integral

Let . We will use the property of definite integrals: .

Step 2: Apply the property

Applying this property, we get:

Step 3: Simplify the integrand

We know that . Therefore,

Substituting this back into the integral, we have:

Step 4: Use logarithm properties

Using the property , we get:

Step 5: Solve for I

Now we have: . Adding to both sides gives:

Therefore, , which means .

Final Answer:

ANSWER

(π)/(8)\log 2

Question 9

QUESTION

Evaluate \int_0^2 x√2-x\,dx.

SOLUTION

We need to evaluate the definite integral . This problem involves integration by substitution.

Step 1: Substitution

Let . Then, and . We also need to change the limits of integration. When , . When , .

Step 2: Rewrite the integral with the substitution

Substituting these values, the integral becomes:

We can change the limits of integration by flipping the sign:

Step 3: Expand the integrand

Expanding the integrand, we get:

Step 4: Integrate term by term

Now we integrate each term with respect to :

Using the power rule for integration, , we have:

Step 5: Evaluate the definite integral

Now we evaluate the expression at the upper and lower limits:

Step 6: Simplify the result

Combining the terms:

Final Answer: The value of the integral is .

ANSWER

16√215

Question 10

QUESTION

Evaluate \int_0^π/2 \big(2\log(\sin x)-\log(\sin 2x)\big)\,dx.

SOLUTION

We need to evaluate the definite integral .

Step 1: Simplify the integrand using logarithm properties

We can rewrite the integrand using the properties of logarithms:

Thus, the integral becomes:

Step 2: Split the integral into separate parts

Step 3: Use the property

Let . Then, using the property:

Therefore, .

Step 4: Simplify the integral further

Substituting this back into our integral, we get:

Step 5: Evaluate the remaining integral

Since , we have:

Final Answer:

The value of the integral is .

ANSWER

(π)/(2)\log\left((1)/(2)\right)

Question 11

QUESTION

Evaluate \int_-π/2^π/2 \sin^2 x\,dx.

SOLUTION

We need to evaluate the definite integral .

Step 1: Check if the function is even or odd

Let . Then . Since , the function is even.

Step 2: Use the property of even functions for definite integrals

For an even function , we have . Therefore,

Step 3: Use the reduction formula or trigonometric identity

We can use the identity . Substituting this into the integral, we get:

Step 4: Evaluate the integral

Final Answer:

ANSWER

(π)/(2)

Question 12

QUESTION

Evaluate \int_0^π (x)/(1+\sin x)\,dx.

SOLUTION

We need to evaluate the definite integral .

Step 1: Use the property of definite integrals

We use the property . In our case, , so we have:

Since , we get:

Step 2: Separate the integral

We can split the integral into two parts:

Notice that the second integral is just , so we have:

Step 3: Solve for I

Adding to both sides, we get:

Step 4: Evaluate the integral

To evaluate , we multiply the numerator and denominator by :

However, and are not defined at . So we split the integral at :

Instead, we use the identity and substitute , so and . When , and when , . Then

Step 5: Final Calculation

Substitute this back into the expression for :

Therefore, .

ANSWER

π

Question 13

QUESTION

Evaluate \int_-π/2^π/2 \sin^7 x\,dx.

SOLUTION

We need to evaluate the definite integral . This problem utilizes the property of definite integrals involving even and odd functions.

Step 1: Identify the function

Let .

Step 2: Check if the function is even or odd

To determine if is even or odd, we need to evaluate .

.

Since , we have:

.

Therefore, is an odd function.

Step 3: Apply the property of definite integrals for odd functions

If is an odd function, then .

In our case, is an odd function and the limits of integration are from to , which are symmetric about 0.

Therefore, .

Final Answer:

Conclusion: The integral evaluates to zero because the integrand is an odd function and the limits of integration are symmetric about the origin. This allows us to directly apply the property of definite integrals, avoiding the need for complex integration techniques.

ANSWER

0

Question 14

QUESTION

Evaluate \int_0^2π \cos^5 x\,dx.

SOLUTION

We need to evaluate the definite integral . This integral involves a trigonometric function raised to an odd power over a full period.

Step 1: Recognize the property of definite integrals

We can use the property that if and if . We need to check .

.

Since , we have .

This doesn't directly help us simplify to 0. Let's try a different approach.

Step 3: Use the reduction formula or symmetry

Since the power of cosine is odd, we can use the symmetry of the cosine function around .

Let .

We can split the integral into two parts: .

In the second integral, let . Then . When , , and when , .

So, .

Since , we have .

Therefore, .

Final Answer:

ANSWER

0

Question 15

QUESTION

Evaluate \int_0^π/2 (\sin x-\cos x)/(1+\sin x\cos x)\,dx.

SOLUTION

We need to evaluate the definite integral .

Step 1: Define the integral

Let .

Step 2: Apply the property of definite integrals

We use the property . In our case, , so we replace with .

Step 3: Simplify using trigonometric identities

We know that and . Substituting these into the integral, we get:

Step 4: Relate the new integral to the original

Notice that the new integral is just the negative of the original integral . So we have:

Step 5: Solve for I

Adding to both sides of the equation , we get:

Dividing both sides by 2, we find:

Final Answer:

ANSWER

0

Question 16

QUESTION

Evaluate \int_0^π \log(1+\cos x)\,dx.

SOLUTION

We need to evaluate the definite integral .

Step 1: Define the integral

Let . We will use the property of definite integrals: .

Step 2: Apply the property

Applying this property, we get: since .

Step 3: Add the two forms of the integral

Adding the two expressions for , we have: Using the property , we get: Since , we have: Using the property .

Step 4: Simplify and use a known result

Dividing by 2, we get: We know that . This is a standard integral result.

Step 5: State the final answer

Therefore,

Thus, .

ANSWER

-π\log 2

Question 17

QUESTION

Evaluate \int_0^a √x√x+√a-x\,dx.

SOLUTION

We need to evaluate the definite integral . This question tests our understanding of definite integrals and the properties associated with them.

Step 1: Define the integral

Let . We will use the property of definite integrals that states .

Step 2: Apply the property

Replacing with in the integral, we get:

Step 3: Add the two forms of the integral

Adding the original integral and the transformed integral, we have:

Step 4: Simplify the integral

The integrand simplifies to 1:

Step 5: Evaluate the simplified integral

Step 6: Solve for I

Dividing both sides by 2, we get:

Final Answer:

The value of the integral is .

ANSWER

(a)/(2)

Question 18

QUESTION

Evaluate \int_0^4 |x-1|\,dx.

SOLUTION

We need to evaluate the definite integral . The key here is to handle the absolute value function.

Step 1: Understand the absolute value function

The absolute value function is defined as:

Step 2: Split the integral based on the absolute value definition

Since the definition of changes at , we split the integral at this point:

Step 3: Apply the definition of absolute value in each integral

For , . For , . So we have:

Step 4: Evaluate the first integral

Step 5: Evaluate the second integral

Step 6: Add the results of the two integrals

Final Answer: The value of the integral is .

ANSWER

5

Question 19

QUESTION

Show that $\int_0^a f(x)g(x)\,dx = 2\int_0^a f(x)\,dx$, if f and g are defined as $f(x)=f(a-x)$ and $g(x)+g(a-x)=4$.

SOLUTION

This question involves evaluating a definite integral with given conditions on the functions and . We will use the property of definite integrals to simplify the expression and prove the given relation.

Step 1: Start with the given integral

We are given the integral: and we want to show that it equals .

Step 2: Apply the property of definite integrals

Use the property: . Applying this to our integral:

Step 3: Use the given conditions

We know that and . Therefore, . Substituting these into the integral:

Step 4: Expand the integral

Step 5: Relate back to the original integral

Now we have:

Adding to both sides:

Step 6: Final simplification

Dividing both sides by 2:

Final Answer: We have shown that .

Question 20

QUESTION

The value of \int_-π/2^π/2 \big(x^3+x\cos x+\tan^5 x+1\big)\,dx is

SOLUTION

We are asked to evaluate the definite integral . This question tests our understanding of definite integrals and properties of even and odd functions.

Step 1: Split the integral

We can split the integral into separate terms:

Step 2: Identify even and odd functions

Recall that:

- An even function satisfies . The integral of an even function from to is .
- An odd function satisfies . The integral of an odd function from to is 0.

Now, let's check each term:

- is an odd function because .
- is an odd function because .
- is an odd function because .
- is an even function.

Step 3: Evaluate the integrals

Since , , and are odd functions, their integrals from to are 0:

The integral of the constant function 1 is:

Step 4: Combine the results

Therefore, the original integral becomes:

However, there seems to be a mistake in the provided correct answer. Let's re-evaluate the integral of 1. It should be . The correct answer should be , not 2.

Final Answer:

ANSWER

2

Question 21

QUESTION

The value of \int_0^π/2 \log\left((4+3\sin x)/(4+3\cos x)\right)\,dx is

SOLUTION

We are asked to evaluate the definite integral .

Step 1: Define the integral

Let .

Step 2: Use the property of definite integrals

We use the property . Here, .

So, .

Step 3: Add the two expressions for I

Adding the two expressions for , we get:

Step 4: Simplify using logarithm properties

Using the property , we have:

Step 5: Evaluate the integral

Since , we have:

Therefore, .

Final Answer: The value of the integral is 0.

Conclusion: The integral evaluates to 0 by using the property of definite integrals and logarithm properties to simplify the expression.

ANSWER

2

📚 Relevant Resources

Explore more NCERT solutions (click links to visit):

Resource	Visit Link
NCERT Class 12 Sociology Textbook	Download Book →

Resource	Visit Link
NCERT Class 10 Maths (Foundation)	View Solutions →

Key Formulas

Important Formulas for Exercise 7.10

Formula / Concept	Description
$\int_a^b f(x) \,dx = [F(x)]_a^b = F(b) - F(a)$	**Second Fundamental Theorem of Calculus:** If f is a continuous function on the closed interval [a, b] and F is an antiderivative of f, then the definite integral of f from a to b is the value of the antiderivative at the upper limit b minus its value at the lower limit a.
$\int_a^b u \, dv = [uv]_a^b - \int_a^b v \, du$	**Integration by Parts (for Definite Integrals):** This formula is used to integrate the product of two functions. It is an extension of the product rule for differentiation. The functions u and v are functions of the integration variable, and the limits of integration apply to the entire expression.
If $x = g(t)$, then $\int_a^b f(x) \,dx = \int_{g^{-1}(a)}^{g^{-1}(b)} f(g(t)) g'(t) \,dt$	**Evaluation of Definite Integrals by Substitution:** When using the substitution method for a definite integral, the limits of integration must be changed to correspond to the new variable.
$\int_a^b f(x) \,dx = \int_a^b f(t) \,dt$	**Property 1:** The value of a definite integral is independent of the variable of integration.
$\int_a^b f(x) \,dx = - \int_b^a f(x) \,dx$	**Property 2:** Interchanging the limits of integration changes the sign of the definite integral.
$\int_a^c f(x) \,dx = \int_a^b f(x) \,dx + \int_b^c f(x) \,dx$	**Property 3:** The integral can be split at any point b between a and c.
$\int_a^b f(x) \,dx = \int_a^b f(a+b-x) \,dx$	**Property 4:** A key property used to simplify many integrals.
$\int_0^a f(x) \,dx = \int_0^a f(a-x) \,dx$	**Property 5:** A special case of Property 4, which is very frequently used in solving problems in this exercise.

More Exercises

Visit all exercises from Chapter 7:

Exercise 7.1 →

Exercise 7.2 →

Exercise 7.3 →

🌐 **Complete Chapter:** Class 12 Maths Ch 7: Integrals →
