# 79) If Integration From -5 To 2 Of F(x) Dx=-17 And Integration From 5 To 3 Of F(x)dx=-4, What Is The

**79) If Integration From -5 To 2 Of F(x) Dx=-17 And Integration From 5 To 3 Of F(x)dx=-4, What Is The**

Understanding the properties of definite integrals is fundamental in calculus, especially when dealing with functions over different intervals. The problem presents two definite integrals involving a function $F(x)$:

- $\int_{-5}^{2} F(x) \, dx = -17$
- $\int_{5}^{3} F(x) \, dx = -4$

The question asks, "What is the" — which, in the context of similar problems, typically pertains to evaluating a combined integral, a related value, or a property involving these integrals.

In this comprehensive guide, we will explore the principles of definite integrals, analyze how to interpret the given information, and deduce the missing or related integral value, likely the integral from $-5$ to $3$ or some other combination.

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## Understanding Definite Integrals and Their Properties

Before diving into calculations, it's crucial to understand the foundational properties of definite integrals that will help us analyze the problem.

### Key Properties of Definite Integrals

1. Linearity:
$$
\int_a^b [c \cdot F(x) + G(x)] \, dx = c \int_a^b F(x) \, dx + \int_a^b G(x) \, dx
$$
2. Additivity over intervals:
$$
\int_a^c F(x) \, dx = \int_a^b F(x) \, dx + \int_b^c F(x) \, dx
$$
3. Reversal of limits:
$$
\int_a^b F(x) \, dx = - \int_b^a F(x) \, dx
$$
4. Zero over zero-length interval:

$$
\int_a^a F(x) \, dx = 0
$$

These properties will serve as the building blocks for solving the problem.

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# Analyzing the Given Integrals

Let's carefully analyze the integrals provided:

- $\int_{-5}^{2} F(x) \, dx = -17$

- $\int_{5}^{3} F(x) \, dx = -4$

Note that the second integral is from 5 to 3, which is in reverse order; we can rewrite it to standard form:

$$
\int_{5}^{3} F(x) \, dx = - \int_{3}^{5} F(x) \, dx
$$

Thus,

$$
- \int_{3}^{5} F(x) \, dx = -4 \Rightarrow \int_{3}^{5} F(x) \, dx = 4
$$

Now, the integrals are:

- $\int_{-5}^{2} F(x) \, dx = -17$
- $\int_{3}^{5} F(x) \, dx = 4$

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# Interpreting the Question

The phrase "What is the" suggests the question might be asking for:

- The value of $\int_{-5}^{5} F(x) \, dx$
- The value of $\int_{-5}^{3} F(x) \, dx$
- The value of $\int_{-5}^{2} F(x) \, dx + \int_{2}^{3} F(x) \, dx$
- Or perhaps, the value of $\int_{-5}^{2} F(x) \, dx + \int_{2}^{3} F(x) \, dx + \int_{3}^{5} F(x) \, dx$

Given the context and typical problems of this sort, the most logical deduction is that the question is:

"What is the value of $\int_{-5}^{5} F(x) \, dx$?"

or perhaps

"What is $\int_{-5}^{3} F(x) \, dx$?"

We will analyze both possibilities, starting with the most probable: finding the integral from $-5$ to $5$.

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# Calculating $\int_{-5}^{5} F(x) \, dx$

To find the integral over the interval $[-5, 5]$, we can utilize the additivity property:

$$
\int_{-5}^{5} F(x) \, dx = \int_{-5}^{2} F(x) \, dx + \int_{2}^{3} F(x) \, dx + \int_{3}^{5} F(x) \, dx
$$

We already know:

- $\int_{-5}^{2} F(x) \, dx = -17$
- $\int_{3}^{5} F(x) \, dx = 4$

The only unknown is $\int_{2}^{3} F(x) \, dx$.

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# Determining $\int_{2}^{3} F(x) \, dx$

Since the problem provides no direct information about $\int_{2}^{3} F(x) \, dx$, we need to consider possible relations or additional assumptions.

Possible approaches:

1. Assumption of continuity and the nature of the function: If $F(x)$ is continuous, the integrals over adjacent intervals can be related if more data is given.

2. Using symmetry or other properties: In the absence of additional data, the most straightforward approach is to deduce the value of $\int_{2}^{3} F(x) \, dx$, or to leave it as an unknown, and express the overall integral accordingly.

3. Suppose the problem is designed so that the total integral from $-5$ to $5$ is the sum of the known parts plus the unknown between 2 and 3:

\[
\int_{-5}^{5} F(x) \, dx = -17 + \int_{2}^{3} F(x) \, dx + 4
\]

If the question is asking "What is the value of \(\int_{-5}^{5} F(x) \, dx\)?", then perhaps the missing integral \(\int_{2}^{3} F(x) \, dx\) is intended to be zero or can be deduced from the context.

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# Possible Scenarios and Final Calculations

Scenario 1: The integral from 2 to 3 is zero

- If \(F(x)\) has an average value of zero over \([2,3]\), then

\[
\int_{2}^{3} F(x) \, dx = 0
\]

and the total integral from \(-5\) to \(5\) becomes:

\[
-17 + 0 + 4 = -13
\]

Scenario 2: The integral from 2 to 3 is unknown

- Without additional data, the best we can do is express the total as:

\[
\int_{-5}^{5} F(x) \, dx = -17 + \int_{2}^{3} F(x) \, dx + 4
\]

- If further information is provided, such as symmetry or the value of the integral over \([2,3]\), the total can be computed explicitly.

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# Conclusion and Final Answer

Given the provided data, the most probable question is: "What is \(\int_{-5}^{5} F(x) \, dx\)?"

Based on the known integrals:

\[
\boxed{

\int_{-5}^{5} F(x) \, dx = \int_{-5}^{2} F(x) \, dx + \int_{2}^{3} F(x) \, dx + \int_{3}^{5} F(x) \, dx
}
\]

which simplifies to:

\[
-17 + \int_{2}^{3} F(x) \, dx + 4
\]

Depending on the context or additional assumptions, the most straightforward answer, assuming \(\int_{2}^{3} F(x) \, dx = 0\), is:

\(\boxed{-13}\)

Therefore, the value of the integral \(\int_{-5}^{5} F(x) \, dx\) is \(-13\).

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## Additional Insights and Related Problems

- Understanding the Sign of Integrals:
- Negative integral values indicate that the function \(F(x)\) is predominantly negative over the interval.
- Positive integral values imply the function is mostly positive.

- Handling Reverse Limits:
- Remember that reversing the limits of an integral changes its sign:
\[
\int_a^b F(x) \, dx = - \int_b^a F(x) \, dx
\]

- Application in Real-Life Contexts:
- Such integrals are useful in calculating net areas, total accumulated quantities, or average values over intervals.

- Practice Problems:
-

## Frequently Asked Questions

### Given that ∫ from -5 to 2 of F(x) dx = -17 and ∫ from 3 to 5 of F(x) dx = -4, what is the value of ∫ from -5 to 5 of F(x) dx?

The value is -21. Since ∫ from -5 to 5 of F(x) dx = ∫ from -5 to 2 of F(x) dx + ∫ from 2 to 5 of F(x) dx, and ∫ from 2 to 3 of F(x) dx can be deduced, but with the given data, the total can be computed as: ∫

from -5 to 2 of F(x) dx + ∫ from 2 to 3 of F(x) dx + ∫ from 3 to 5 of F(x) dx. Without the value of ∫ from 2 to 3, more info is needed. However, if assuming the integral from 2 to 3 is zero or given, the total can be calculated accordingly.

## How can the given integrals help in determining the average value of F(x) over the interval [-5, 5]?

The average value is calculated as (1/total length) times the integral over the interval. Using the known integrals, if the total integral from -5 to 5 is known, the average can be found as (1/10) × ∫ from -5 to 5 of F(x) dx.

## If ∫ from -5 to 2 of F(x) dx = -17 and ∫ from 3 to 5 of F(x) dx = -4, what additional information is needed to find the value of ∫ from 2 to 3 of F(x) dx?

The value of ∫ from 2 to 3 of F(x) dx is needed. This could be given directly or inferred if more data about F(x) or its properties (like continuity or symmetry) is provided.

## Can the given integrals be used to determine whether F(x) is an increasing or decreasing function over the intervals?

Not directly. Integrals provide the net area under the curve but do not specify the exact behavior of F(x). Additional information about F(x) or its derivatives is necessary to determine where it is increasing or decreasing.

## What assumptions can be made about F(x) based on the negative values of the integrals provided?

The negative values suggest that F(x) is predominantly negative over the intervals considered, indicating that the function may be decreasing or below the x-axis over those segments. However, the precise behavior depends on F(x)'s specific form.

# Additional Resources

Understanding the Problem: Integration from -5 to 2 of F(x) dx = -17 and from 5 to 3 of F(x) dx = -4—What Is the?

When approaching problems involving definite integrals, especially those with bounds that are not in the typical ascending order, it's essential to understand the fundamental properties of integrals, the significance of the given values, and how these pieces fit into the broader context of calculus. This review-style discussion aims to dissect the problem thoroughly, exploring the underlying concepts, potential interpretations, and the methodologies involved in solving related questions.

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# Introduction to the Problem

The problem presents two definite integrals involving a function $F(x)$:

- $\displaystyle \int_{-5}^{2} F(x) \, dx = -17$
- $\displaystyle \int_{5}^{3} F(x) \, dx = -4$

and asks, "What is the?" (presumably asking for a particular quantity derived from or related to these integrals). Since the question appears incomplete or truncated, typical interpretations involve determining certain properties, sums, or specific values connected to these integrals, such as the value of another integral, the sum of the integrals, or perhaps the value of an integral involving $F(x)$ over a different interval.

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# Fundamentals of Definite Integrals

Before delving into the specifics, it’s vital to review the core principles related to definite integrals:

## Properties of Definite Integrals

- Linearity: For constants $a$ and $b$,
$$
\int_a^b c \cdot F(x) \, dx = c \int_a^b F(x) \, dx
$$
- Additivity over intervals:
$$
\int_a^c F(x) \, dx = \int_a^b F(x) \, dx + \int_b^c F(x) \, dx
$$
- Reversal of limits:
$$
\int_a^b F(x) \, dx = - \int_b^a F(x) \, dx
$$
This property is particularly relevant here because the second integral has limits from 5 to 3 (descending order).

- Relation to the area under the curve:
The value of the integral represents the net area between $F(x)$ and the x-axis over the specified interval. Negative values indicate the area is below the x-axis.

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# Analyzing the Given Integrals

Let's interpret the provided integrals carefully:

1. $\displaystyle \int_{-5}^{2} F(x) \, dx = -17$

- The interval spans from $-5$ to $2$, which is an increasing interval.
- The negative value $-17$ indicates the net area under $F(x)$ over this interval is below the x-axis, summing to $-17$.

2. $\displaystyle \int_{5}^{3} F(x) \, dx = -4$

- The interval is from 5 to 3, which is decreasing; to interpret this integral in the conventional way, we can flip the limits:
$$
\int_{5}^{3} F(x) \, dx = - \int_{3}^{5} F(x) \, dx
$$
- Given that the integral equals $-4$, then:
$$
- \int_{3}^{5} F(x) \, dx = -4
$$
$$
\Rightarrow \int_{3}^{5} F(x) \, dx = 4
$$
- This indicates the net area over the interval from 3 to 5 is +4, meaning the function is predominantly above the x-axis in this region.

Summary of what we know:

| Integral | Limits | Value | Interpretation |
|------------|---------|--------|----------------|
| $\int_{-5}^{2} F(x) dx$ | $-5$ to $2$ | $-17$ | Net area below x-axis over $[-5, 2]$ |
| $\int_{5}^{3} F(x) dx$ | $5$ to $3$ | $-4$ | Equivalent to $- \int_{3}^{5} F(x) dx = -4$; so $\int_{3}^{5} F(x) dx = 4$ |

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# Key Concepts for Further Analysis

Given these integral values, certain natural questions arise, such as:

- What is the value of the integral over the combined interval $[-5, 5]$?
- What if the problem asks for the sum of the integrals over these intervals?
- How do the properties of the integral help to connect these values?
- Is the function $F(x)$ continuous? (The problem does not specify, but typical assumptions in calculus problems involve continuous functions unless stated otherwise.)

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# Combining and Manipulating Integrals

1. Using Additivity of Integrals

Suppose the goal is to find the integral over the combined interval $[-5, 5]$. We can split this into two parts:

$$
\int_{-5}^{5} F(x) \, dx = \int_{-5}^{3} F(x) \, dx + \int_{3}^{5} F(x) \, dx
$$

But we only know $\int_{-5}^{2} F(x) \, dx$ and $\int_{3}^{5} F(x) \, dx$. To find $\int_{-5}^{3} F(x) \, dx$, we can analyze the interval from $-5$ to 3:

$$
\int_{-5}^{3} F(x) \, dx = \int_{-5}^{2} F(x) \, dx + \int_{2}^{3} F(x) \, dx
$$

We already know:

$$
\int_{-5}^{2} F(x) \, dx = -17
$$

However, $\int_{2}^{3} F(x) \, dx$ is unknown. So unless additional information is provided about the behavior of $F(x)$ between 2 and 3, we cannot compute this directly.

Similarly, the integral from 3 to 5 is known as 4.

2. Potential Goal: Sum of the Integrals

Often, in such problems, the question might be:

- Find the sum $\int_{-5}^{2} F(x) \, dx + \int_{3}^{5} F(x) \, dx$
- Or find the integral over the entire interval $[-5, 5]$

In that case:

$$
\int_{-5}^{5} F(x) \, dx = \left( \int_{-5}^{2} F(x) \, dx \right) + \left( \int_{2}^{3} F(x) \, dx \right) + \left( \int_{3}^{5} F(x) \, dx \right)
$$

Given the known values:

$$
= -17 + \int_{2}^{3} F(x) \, dx + 4
$$

Without knowing $\int_{2}^{3} F(x) \, dx$, we cannot find the exact sum.

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# Addressing the Incomplete Question

Since the original problem appears to end with "What is the," it suggests that the question might be:

- "What is the value of $\int_{-5}^{5} F(x) dx$?"
- "What is the value of $\int_{-5}^{2} F(x) dx + \int_{3}^{5} F(x) dx$?"
- Or perhaps, "What is the value of $\int_{-5}^{2} F(x) dx + \int_{5}^{3} F(x) dx$?"

Let's explore the last possibility because it directly involves the given integrals:

Sum of the two integrals:

$$
\int_{-5}^{2} F(x) \, dx + \int_{5}^{3} F(x) \, dx
$$

Recall that:

$$
\int_{5}^{3} F(x) \, dx = - \int_{3}^{5} F(x) \, dx = -4
$$

Thus,

$$
\int_{-5}^{2} F(x) \, dx + \int_{5}^{3} F(x) \, dx = -17 + (-4) = -21
$$

This sum signifies the net "total" over the combined intervals, but because the integral from 5 to 3 is in decreasing order, its value is negative, consistent with the earlier interpretation.

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# Deeper Insights and Theoretical Considerations

1. Symmetry and Behavior of $F(x)$

- The negative integral over $[-5, 2]$ suggests that $F(x)$ is predominantly negative or below the x-axis in this region.
- The positive integral from 3 to

# 79 If Integration From 5 To 2 Of F X Dx 17 And Integration From 5 To 3 Of F X Dx 4 What Is The

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