



## Introduction to Integration

Welcome to the world of calculus! In this worksheet, we will explore the power rule and constant multiple rule for integration. These rules are fundamental concepts in calculus, and understanding them is essential for solving a wide range of mathematical problems.

The power rule states that for a function of the form  $x^n$ , the integral is  $(x^{(n+1)})/(n+1) + C$ , where  $n$  is a constant and  $C$  is the constant of integration.

## Example 1: Power Rule

Find the integral of  $x^2$ .

Solution:  $\int x^2 dx = (x^3)/3 + C$

## What is the Constant Multiple Rule?

*The constant multiple rule states that the integral of a constant multiple of a function is equal to the constant times the integral of the function.*

Example: Find the integral of  $2x$ .

Solution:  $\int 2x \, dx = 2 \int x \, dx = x^2 + C$

## Practice Questions

*Find the integral of the following functions:*

1.  $x^3$
2.  $3x^2$
3.  $x^4 + 2x^2$

## Answers

Check your work with the following answers:

1.  $\int x^3 dx = (x^4)/4 + C$
2.  $\int 3x^2 dx = 3(x^3)/3 + C = x^3 + C$
3.  $\int x^4 + 2x^2 dx = (x^5)/5 + 2(x^3)/3 + C$

## Real-World Applications

*The power rule and constant multiple rule have numerous applications in physics, engineering, and economics. Research and present on a real-world application of these rules.*

## Activity 1: Research and Presentation

*Work in groups to research and present on a real-world application of the power rule and constant multiple rule.*

Some possible topics to consider:

- Calculating the area under curves
- Finding the volume of solids
- Determining the center of mass

## Activity 2: Practice Problems

*Work in pairs to solve a set of practice problems that require the application of the power rule and constant multiple rule.*

## Assessment

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Can you:

1. Explain the power rule and constant multiple rule in your own words?
2. Apply the power rule and constant multiple rule to solve basic integration problems?
3. Identify the importance of integration in real-world applications?

## Conclusion

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*In conclusion, the power rule and constant multiple rule are fundamental concepts in integration, and understanding these rules is essential for solving a wide range of mathematical problems.*

By mastering these rules, you will be well-equipped to tackle more advanced topics in calculus and develop a deeper understanding of the underlying mathematical concepts.

## Glossary

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*Key terms to remember:*

- Power Rule: A rule used in integration that states  $\int x^n dx = (x^{n+1})/(n+1) + C$ .
  - Constant Multiple Rule: A rule used in integration that states  $\int k \cdot f(x) dx = k \cdot \int f(x) dx$ .
  - Integration: The process of finding the antiderivative of a function.
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## References

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*For further learning:*

- Khan Academy: Integration
  - MIT OpenCourseWare: Calculus
  - Wolfram Alpha: Integration Calculator
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