

Find The Sum:(-2z To The Power Of 2 +4)+(8z To The Power Of 3 +6z To The Power Of 2 -12)

Find The Sum:(-2z To The Power Of 2 +4)+(8z To The Power Of 3 +6z To The Power Of 2 -12) is a mathematical expression that involves combining polynomial terms in order to simplify the overall sum. This type of problem is common in algebra, especially when working with polynomials and expressions involving powers of a variable, such as z . To efficiently find the sum, it's important to understand how to combine like terms, simplify exponents, and perform basic arithmetic operations.

In this article, we will explore the step-by-step process of simplifying the given expression, discuss relevant algebraic concepts, and provide tips for handling similar polynomial sums. Whether you're a student learning algebra or someone looking to strengthen your mathematical skills, understanding how to approach such problems is essential.

Understanding the Given Expression

Before jumping into the calculation, let's analyze the expression:

$$(-2z^2 + 4) + (8z^3 + 6z^2 - 12)$$

This expression is composed of two separate groups (or polynomials), which are added together. The first group contains:

- a quadratic term: $-2z^2$
- a constant: $+4$

The second group contains:

- a cubic term: $8z^3$
- a quadratic term: $+6z^2$
- a constant: -12

When added, these terms combine to form a single polynomial. The key is to identify like terms and combine them accordingly.

Step-by-Step Simplification Process

Step 1: Write the Expression Clearly

Start by rewriting the expression without parentheses:

$$-2z^2 + 4 + 8z^3 + 6z^2 - 12$$

Step 2: Group Like Terms

Identify terms with the same degree (power of z):

- Cubic terms: $8z^3$
- Quadratic terms: $-2z^2$ and $+6z^2$
- Constant terms: 4 and -12

Arrange the expression in order:

$$8z^3 + (-2z^2 + 6z^2) + (4 - 12)$$

Step 3: Combine Like Terms

Now, perform the addition/subtraction of like terms:

- For the cubic term: $8z^3$ (no other cubic term to combine)
- For the quadratic terms: $-2z^2 + 6z^2 = 4z^2$
- For the constants: $4 - 12 = -8$

Step 4: Write the Final Simplified Expression

Putting it all together:

$$8z^3 + 4z^2 - 8$$

This is the simplified form of the original expression, representing the sum of the two polynomials.

Understanding Polynomial Terms and Their Significance

To deepen your understanding, it's important to recognize the roles of different polynomial terms and how they behave during addition.

1. Degree of a Polynomial

The degree is determined by the highest power of the variable z in the polynomial. In our simplified expression, $8z^3$ is of degree 3, making it a cubic polynomial.

2. Like Terms

Terms with the same variable raised to the same power are called like terms. Combining them simplifies the polynomial. For example:

- $-2z^2$ and $+6z^2$ are like terms.
- 4 and -12 are constants and can be combined directly.

3. Importance of Proper Grouping

Grouping like terms before combining ensures accuracy and simplifies the process, especially in complex expressions.

Additional Examples of Polynomial Addition

Understanding the process through additional examples can reinforce the concept.

Example 1:

Simplify: $(3z^2 + 5z - 7) + (2z^2 - 3z + 4)$

Solution:

- Group like terms: $(3z^2 + 2z^2) + (5z - 3z) + (-7 + 4)$
- Combine: $5z^2 + 2z, + 2, -3$

Answer: $5z^2 + 2z - 3$

Example 2:

Simplify: $(4z^3 - z + 9) + (z^3 + 2z - 3)$

Solution:

- Group: $(4z^3 + z^3) + (-z + 2z) + (9 - 3)$

- Combine: $5z^3 + z + 6$

Answer: $5z^3 + z + 6$

Tips for Simplifying Polynomial Sums

To efficiently handle polynomial addition, consider the following tips:

- **Arrange terms in order:** Always write polynomials in descending order of degree for clarity.
- **Identify like terms:** Carefully compare the powers of z to find terms to combine.
- **Combine coefficients:** Add or subtract the numerical coefficients of like terms.
- **Pay attention to signs:** Keep track of positive and negative signs to avoid errors.
- **Double-check your work:** After combining, verify each term to ensure correctness.

Applications of Polynomial Addition

Understanding how to find sums of polynomials is fundamental in various fields:

1. Algebraic Simplification

Simplifying complex expressions in algebra to prepare for solving equations or graphing functions.

2. Calculus

Polynomials are foundational in calculus, especially when deriving or integrating functions.

3. Engineering and Physics

Modeling physical phenomena often involves polynomial equations, and simplifying these helps analyze systems efficiently.

4. Computer Science

Algorithms involving polynomial computations, including coding theory and cryptography, rely on polynomial arithmetic.

Conclusion

In summary, to find the sum of the expression $(-2z^2 + 4) + (8z^3 + 6z^2 - 12)$, the key steps involve rewriting the expression, grouping like terms, and then combining coefficients. The final simplified form is $8z^3 + 4z^2 - 8$. Mastering this process enhances your algebraic skills and prepares you for more advanced mathematical problem-solving.

Remember the importance of understanding polynomial structure, recognizing like terms, and practicing with various examples. Whether dealing with basic algebra or complex polynomial expressions, these skills are essential tools for anyone pursuing mathematics, engineering, or sciences. Keep practicing, and you'll find that simplifying polynomial sums becomes an intuitive and efficient process.

Frequently Asked Questions

What is the expression to find the sum in the problem?

The expression is $(-2z^2 + 4) + (8z^3 + 6z^2 - 12)$.

How do you combine like terms in the given expression?

Combine the coefficients of like powers of z : for z^3 , z^2 , and constants separately.

What is the sum of the z^3 terms in the expression?

The sum of the z^3 terms is $8z^3$, as it appears only once in the second group.

What is the combined coefficient of z^2 after adding the terms?

The coefficients of z^2 are -2 and $+6$, so combined they give $(-2 + 6)z^2 = 4z^2$.

What is the sum of the constant terms in the expression?

The constant terms are 4 and -12 , which sum to $4 + (-12) = -8$.

What is the simplified expression after combining all like terms?

The simplified sum is $8z^3 + 4z^2 - 8$.

Why is it important to group like terms when finding the sum?

Grouping like terms ensures accurate addition of coefficients for each power of z , resulting in a correct simplified expression.

What is the final answer to the sum of the given algebraic expression?

The final simplified sum is $8z^3 + 4z^2 - 8$.

Additional Resources

Find The Sum: $(-2z^2 + 4) + (8z^3 + 6z^2 - 12)$ — an algebraic challenge that exemplifies the fundamental principles of polynomial addition, a cornerstone concept in algebra. This problem, seemingly straightforward, provides an excellent opportunity to explore the nuances of combining like terms, understanding polynomial structures, and appreciating the elegance of algebraic simplification. As students and enthusiasts delve into this problem, they not only sharpen their computational skills but also deepen their conceptual understanding of polynomial expressions and their manipulations.

In this comprehensive review, we will dissect the problem step-by-step, elucidate the underlying principles, and discuss the broader significance of such operations within mathematics. Whether you're a student preparing for exams, an educator designing curriculum, or a mathematics enthusiast seeking to refresh your knowledge, this article aims to serve as an authoritative guide.

Understanding the Problem: Breaking Down the Expression

Before diving into calculations, it's essential to comprehend what the problem entails. The expression given is:

$$(-2z^2 + 4) + (8z^3 + 6z^2 - 12)$$

This expression is a sum of two polynomial expressions. To find the sum, the primary goal is to combine like terms—terms with the same variable raised to the same power.

Key points to note:

1. Polynomials involved:
 - First polynomial: $-2z^2 + 4$
 - Second polynomial: $8z^3 + 6z^2 - 12$
2. Variables:
 - The variable used is 'z'.
 - Powers involved are z^3 and z^2 , along with constant terms.
3. Operation:
 - Addition of the two polynomials.

Why is this important?

Understanding the structure of the expression helps in systematically approaching the problem, ensuring no terms are missed or misaligned.

Step-by-Step Solution: Combining Like Terms

The process of addition involves aligning similar terms—terms with the same degree of z —and then summing their coefficients.

Step 1: Write the expression clearly

$$\begin{aligned} & \backslash \\ & (-2z^2 + 4) + (8z^3 + 6z^2 - 12) \\ & \backslash \end{aligned}$$

Step 2: Remove parentheses

Since addition is commutative, the parentheses can be removed, but it's often helpful to

write terms in descending order of powers for clarity:

$$8z^3 + (-2z^2 + 6z^2) + (4 - 12)$$

Step 3: Group like terms

- z^3 terms: $8z^3$
- z^2 terms: $-2z^2$ and $+6z^2$
- Constants: 4 and -12

Step 4: Combine coefficients

- For z^3 : Only one term, so it remains $8z^3$.
- For z^2 : $-2z^2 + 6z^2 = (6 - 2)z^2 = 4z^2$.
- For constants: $4 - 12 = -8$.

Step 5: Write the simplified polynomial

$$8z^3 + 4z^2 - 8$$

This is the sum of the two given polynomials.

Mathematical Significance of Polynomial Addition

The process illustrated above is a fundamental operation in algebra, underpinning more advanced mathematical concepts and applications.

When and Why Do We Add Polynomials?

- Simplification: Combining like terms simplifies expressions, making them easier to analyze.
- Polynomial algebra: Addition is foundational for polynomial operations—useful in algebraic equations, calculus, and beyond.
- Modeling real-world problems: Many real-world phenomena, such as physics and economics, are modeled using polynomial expressions. Proper addition allows for the combination of multiple models or factors.

Key Principles in Polynomial Addition

- Like terms are terms with the same variables raised to the same powers.
- Coefficients are combined by addition or subtraction.
- The degree of the resulting polynomial is the highest degree among the combined terms.

Broader Context: Polynomial Operations and Their Applications

While the specific problem involves addition, understanding this operation sets the stage for other polynomial manipulations.

1. Polynomial Subtraction

Similar to addition, but involves subtracting coefficients of like terms. For example:

$$\begin{array}{l} \backslash \\ (3z^3 + 2z^2) - (z^3 + z) \\ \backslash \end{array}$$

which results in:

$$\begin{array}{l} \backslash \\ (3z^3 - z^3) + 2z^2 - z = 2z^3 + 2z^2 - z \\ \backslash \end{array}$$

2. Polynomial Multiplication

Involves distributing each term from one polynomial across all terms of the other, applying the distributive property.

3. Polynomial Division

Used for dividing polynomials to find quotient and remainder, essential in algebra and calculus.

4. Polynomial Factoring

Expressing a polynomial as a product of its factors, which simplifies solving equations.

Applications in Science and Engineering

- Physics: Kinematic equations often involve polynomials.
 - Economics: Cost, revenue, and profit functions are modeled with polynomials.
 - Computer Science: Polynomial interpolation and error correction algorithms rely on polynomial operations.
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Advanced Topics Related to Polynomial Addition

For those interested in delving deeper, the topic of polynomial addition opens pathways to more advanced mathematical areas:

A. Polynomial Rings

Polynomials with coefficients in a given field (like real numbers) form structures called polynomial rings, fundamental in abstract algebra.

B. Polynomial Interpolation

Using polynomial addition to construct functions that pass through a given set of points, vital in numerical analysis.

C. Multivariate Polynomials

Extending addition to polynomials with multiple variables, which are crucial in higher-dimensional modeling.

Conclusion: The Significance of Mastering Polynomial Addition

The simple act of adding two polynomials, as demonstrated in the initial problem, encapsulates core algebraic principles essential for higher mathematics and numerous scientific disciplines. It exemplifies the importance of recognizing like terms, systematically combining coefficients, and maintaining clarity in algebraic manipulations. Mastery of such operations paves the way for understanding more complex mathematical concepts, from calculus to abstract algebra.

In practical terms, being adept at polynomial operations allows mathematicians, scientists, and engineers to model complex systems, analyze data, and develop solutions across a variety of fields. The exercise of summing $(-2z^2 + 4)$ and $(8z^3 + 6z^2 - 12)$ is more than a classroom problem; it is a microcosm of the power and elegance of algebraic thinking.

Whether you approach it as a step toward more advanced topics or as a fundamental skill, recognizing the structure and operations of polynomials enhances your mathematical literacy and problem-solving toolkit. As mathematics continues to evolve, the foundational skills in polynomial addition remain as relevant as ever, embodying the beauty of structure, pattern, and logical reasoning that mathematics offers.

In summary:

- The sum of $(-2z^2 + 4)$ and $(8z^3 + 6z^2 - 12)$ simplifies to $8z^3 + 4z^2 - 8$.
- The process involves identifying like terms and combining their coefficients.
- Polynomial addition is a fundamental operation with broad applications across science, engineering, and mathematics.
- Mastery of such operations provides a stepping stone to understanding more advanced algebraic concepts and solving real-world problems.

By grasping these principles, learners can confidently manipulate and analyze polynomial expressions, strengthening their overall mathematical competence.

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