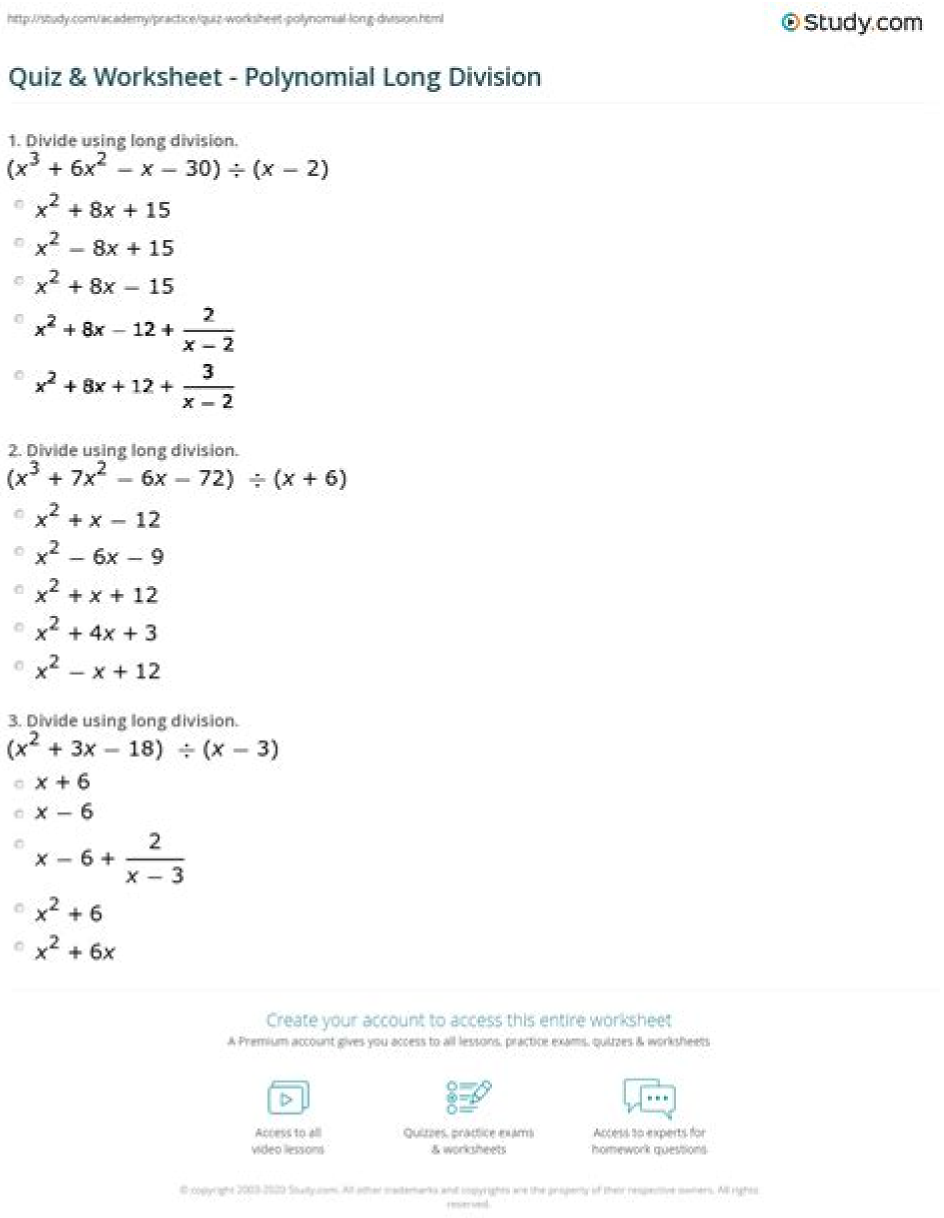
Long Division Of Polynomials Worksheet With Answers



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Quiz & Worksheet - Polynomial Long Division

1. Divide using long division.

$(x^3 + 6x^2 - x - 30) \div (x - 2)$

○ $x^2 + 8x + 15$
○ $x^2 - 8x + 15$
○ $x^2 + 8x - 15$
○ $x^2 + 8x - 12 + \frac{2}{x-2}$
○ $x^2 + 8x + 12 + \frac{3}{x-2}$

2. Divide using long division.

$(x^3 + 7x^2 - 6x - 72) \div (x + 6)$

○ $x^2 + x - 12$
○ $x^2 - 6x - 9$
○ $x^2 + x + 12$
○ $x^2 + 4x + 3$
○ $x^2 - x + 12$

3. Divide using long division.

$(x^2 + 3x - 18) \div (x - 3)$

○ $x + 6$
○ $x - 6$
○ $x - 6 + \frac{2}{x-3}$
○ $x^2 + 6$
○ $x^2 + 6x$

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Long division of polynomials worksheet with answers is a crucial tool for students and educators alike when it comes to mastering polynomial division. This mathematical process is essential for simplifying complex expressions, solving polynomial equations, and understanding higher-level algebra concepts. In this article, we will explore the steps involved in polynomial long division, provide a detailed worksheet with practice problems, and include answers to facilitate self-study.

Understanding Polynomial Long Division

Polynomial long division is a method used to divide one polynomial by another, similar to how we perform long division with numbers. The goal is to break down a polynomial into simpler components. This process involves several steps:

1. Identify the Dividend and Divisor: The polynomial you want to divide is called the dividend, while the polynomial you are dividing by is known as the divisor.
2. Set Up the Division: Write the dividend under the long division symbol and the divisor outside.
3. Divide the Leading Terms: Take the leading term of the dividend and divide it by the leading term of the divisor. This gives the first term of the quotient.
4. Multiply and Subtract: Multiply the entire divisor by the term obtained in the previous step and subtract this result from the dividend.
5. Repeat: Bring down the next term from the dividend and repeat the process until all terms have been brought down.

Example of Polynomial Long Division

Let’s consider a simple example to illustrate the process:

Divide \(2x^3 + 3x^2 - 5x + 6\) by \(x - 2\).

1. Set Up:
\[
\begin{array}{r|l}
x - 2 & 2x^3 + 3x^2 - 5x + 6 \\
\end{array}
\]

2. Divide Leading Terms:
\[
\frac{2x^3}{x} = 2x^2
\]

3. Multiply and Subtract:
Multiply \(2x^2\) by \(x - 2\):
\[
2x^2(x - 2) = 2x^3 - 4x^2
\]
Subtract this from the original polynomial:
\[

(2x^3 + 3x^2) - (2x^3 - 4x^2) = 7x^2
\]

4. Bring Down:
Bring down the next term (-5x):
\[
7x^2 - 5x
\]

5. Repeat:
Divide the leading term:
\[
\frac{7x^2}{x} = 7x
\]
Multiply:
\[
7x(x - 2) = 7x^2 - 14x
\]
Subtract:
\[
(7x^2 - 5x) - (7x^2 - 14x) = 9x
\]
Bring down the next term (6):
\[
9x + 6
\]

6. Final Steps:
Divide:
\[
\frac{9x}{x} = 9
\]
Multiply:
\[
9(x - 2) = 9x - 18
\]
Subtract:
\[
(9x + 6) - (9x - 18) = 24
\]

Now we can summarize the result:
\[

2x^2 + 7x + 9 + \frac{24}{x - 2}
\]

Thus, the division of \(2x^3 + 3x^2 - 5x + 6\) by \(x - 2\) gives a quotient of \(2x^2 + 7x + 9\) and a remainder of \(24\).

Practice Worksheet for Long Division of Polynomials

To help you practice polynomial long division, below is a worksheet with various problems. Try solving them, and then check your answers at the end of this article.

Worksheet Problems

1. Divide \(3x^4 - 5x^3 + 6x^2 - 2\) by \(x - 1\).
2. Divide \(4x^3 + 2x^2 - 8x + 5\) by \(2x + 1\).
3. Divide \(x^5 - 4x^3 + 2x - 8\) by \(x^2 - 3\).
4. Divide \(5x^2 + 4x + 3\) by \(x + 1\).
5. Divide \(2x^3 + 3x^2 - x - 7\) by \(x^2 + 2\).

Answers to the Worksheet Problems

Here are the solutions to the problems provided in the worksheet. Compare your answers with these to assess your understanding of polynomial long division.

1. Answer: \(3x^3 - 2x^2 + 4x + 2\) with a remainder of \(0\).
2. Answer: \(2x^2 - 1x + 5\) with a remainder of \(0\).
3. Answer: \(x^3 + 3x^2 + 11x + 33\) with a remainder of \(81\).
4. Answer: \(5x + (-1)\) with a remainder of \(4\).
5. Answer: \(2x + (-1)\) with a remainder of \(5\).

Conclusion

The **long division of polynomials worksheet with answers** is an invaluable resource for students seeking to master polynomial division. Practicing these problems not only helps in reinforcing skills but also builds confidence in handling more complex algebraic concepts. By breaking down the process into manageable steps and providing practice opportunities, learners can achieve a solid understanding of polynomial long division. Remember, consistent practice is key to success in mathematics!

Frequently Asked Questions

What is long division of polynomials?

Long division of polynomials is a method used to divide a polynomial by another polynomial, similar to long division with numbers.

How do you set up a long division problem with polynomials?

To set up a long division problem with polynomials, write the dividend (the polynomial being divided) under a long division symbol and the divisor (the polynomial you are dividing by) outside of it.

What is the first step in polynomial long division?

The first step is to divide the leading term of the dividend by the leading term of the divisor to find the first term of the quotient.

What do you do after finding the first term of the quotient in polynomial long division?

After finding the first term of the quotient, you multiply the entire divisor by this term and subtract the result from the dividend.

How do you handle remainders in long division of polynomials?

If a remainder exists after subtracting, it is written as part of the final answer, often as a fraction with the remainder over the original divisor.

Can you provide an example of a polynomial long division problem?

Sure! For example, dividing (2x^3 + 3x^2 - x + 5) by (x + 1) involves several steps of division, multiplication, and subtraction to reach the final quotient and remainder.

Are there worksheets available for practicing long division of polynomials?

Yes, many educational websites and resources offer worksheets on long division of polynomials, often including answers for self-checking.

What skills are necessary to solve long division of polynomial problems effectively?

Key skills include understanding polynomial terms, performing polynomial multiplication and subtraction, and being comfortable with algebraic manipulation.

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