Lesson 4: Comparing Methods—Long Division, Again?

Example 1

If $x = 10$, then the division $1573 \div 13$ can be represented using polynomial division.

$$x+3 \overline{\smash{\big)} x^3+5x^2+7x+3}$$

Example 2

Use the long division algorithm for polynomials to evaluate

$$\frac{2x^3 - 4x^2 + 2}{2x - 2}.$$

Exercises 1–8

Choose 3 exercises (one from each box) and solve with **Polynomial Long Division** and then check your work using the **Reverse Tabular Method.** Yes, you need to do each problem two times. Believe me, if you do this, you'll be totally ready!

1. $\frac{x^2+6x+9}{x+3}$

2. $\frac{7x^3-8x^2-13x+2}{7x-1}$

3. $\frac{x^3-27}{x-3}$

4. $\frac{2x^4+14x^3+x^2-21x-6}{2x^2-3}$

5. $\frac{5x^4-6x^2+1}{x^2-1}$

6. $\frac{x^6+4x^4-4x-1}{x^3-1}$

7. $\frac{2x^7+x^5-4x^3+14x^2-2x+7}{2x^2+1}$

Lesson Summary

The long division algorithm to divide polynomials is analogous to the long division algorithm for integers. The long division algorithm to divide polynomials produces the same results as the reverse tabular method.

Extra Practice Problems

Use the long division algorithm to determine the quotient in problems 1–5.

1. $\frac{2x^3-13x^2-x+3}{2x+1}$

2. $\frac{3x^3+4x^2+7x+22}{x+2}$

3. $\frac{x^4+6x^3-7x^2-24x+12}{x^2-4}$

4. $(12x^4 + 2x^3 + x - 3) \div (2x^2 + 1)$

5. $(2x^3 + 2x^2 + 2x) \div (x^2 + x + 1)$

6. In parts a–b and d–e, use long division to evaluate each quotient. Then, answer the remaining questions.

a. $\frac{x^2-9}{x+3}$

b. $\frac{x^4-81}{x+3}$

c. Is $x+3$ a factor of x^3-27? Explain your answer using the long division algorithm.

d. $\frac{x^3+27}{x+3}$

e. $\frac{x^5+243}{x+3}$

f. Is $x+3$ a factor of x^2+9? Explain your answer using the long division algorithm.

g. For which positive integers n is $x+3$ a factor of x^n+3^n? Explain your reasoning.

h. If n is a positive integer, is $x+3$ a factor of x^n-3^n? Explain your reasoning.