

5-4

Reteaching (continued)

Dividing Polynomials – Synthetic Division

Problem

Use synthetic division to divide $x^3 + 13x^2 + 46x + 48$ by $x + 3$. What is the quotient and remainder?

Step 1 Set up your polynomial division.

$$(x^3 + 13x^2 + 46x + 48) \div (x + 3)$$

Step 2 Reverse the sign of the constant, 3, in the divisor.
Write the coefficients of the dividend: 1 13 46 48.

$$\begin{array}{r|rrrr} -3 & 1 & 13 & 46 & 48 \\ \hline \end{array}$$

Step 3 Bring the first coefficient, 1, down to the bottom line.

$$\begin{array}{r|rrrr} -3 & 1 & 13 & 46 & 48 \\ \hline & 1 & & & \end{array}$$

Step 4 Multiply the coefficient, 1, by the divisor, -3 . Put this product, -3 , underneath the second coefficient 13, and add those two numbers: $13 + (-3) = 10$.

$$\begin{array}{r|rrrr} -3 & 1 & 13 & 46 & 48 \\ \hline & 1 & -3 & & \\ & & 10 & & \end{array}$$

Step 5 Continue multiplying and adding through the last coefficient. The final sum is the remainder.

$$\begin{array}{r|rrrr} -3 & 1 & 13 & 46 & 48 \\ \hline & 1 & -3 & -30 & -48 \\ & & 10 & 16 & 0 \end{array}$$

The quotient is $x^2 + 10x + 16$. Since the remainder is 0, $x + 3$ is a factor of $x^3 + 13x^2 + 46x + 48$.

Exercises

What is the quotient and remainder of the following polynomials?

11. $(x^3 - 2x + 8) \div (x + 2)$

12. $(12x^3 - 71x^2 + 57x - 10) \div (x - 5)$

13. $(3x^4 + x^3 - 6x^2 - 9x + 12) \div (x + 1)$

14. $(2x^3 - 15x + 23) \div (x - 2)$

15. $(x^3 + x + 10) \div (x + 2)$

16. $(x^4 - 12x^3 - 18x^2 + 10) \div (x + 4)$