

## Lesson 3: The Division of Polynomials

### Opening Exercise

- a. Multiply these polynomials using the tabular method.

$$(2x + 5)(x^2 + 5x + 1)$$

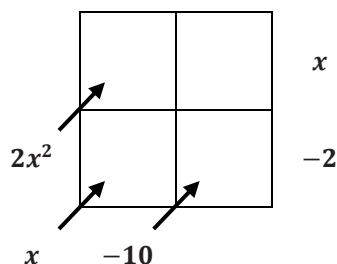
- b. How can you use the expression in part (a) to quickly multiply  $25 \times 151$ ?

### Exploratory Challenge

1. Does  $\frac{2x^3 + 15x^2 + 27x + 5}{2x + 5} = (x^2 + 5x + 1)$ ? Justify your answer.


2. Describe the process you used to determine your answer to Exercise 1.

3. Reverse the tabular method of multiplication to find the quotient:  $\frac{2x^2+x-10}{x-2}$ .



4. Test your conjectures. Create your own table and use the *reverse tabular method* to find the quotient.

$$\frac{x^4 + 4x^3 + 3x^2 + 4x + 2}{x^2 + 1}$$

5. Test your conjectures. Use the *reverse tabular method* to find the quotient.

$$\frac{3x^5 - 2x^4 + 6x^3 - 4x^2 - 24x + 16}{x^2 + 4}$$

6. What is the quotient of  $\frac{x^5-1}{x-1}$ ? Of  $\frac{x^6-1}{x-1}$ ?

## Problem Set

Use the reverse tabular method to solve these division problems.

1.  $(2x^3 + x^2 - 16x + 15) \div (2x - 3)$

2.  $(3x^5 + 12x^4 + 11x^3 + 2x^2 - 4x - 2) \div (3x^2 - 1)$

3.  $\frac{x^3 - 4x^2 + 7x - 28}{x^2 + 7}$

4.  $\frac{x^4 - 2x^3 - 29x - 12}{x^3 + 2x^2 + 8x + 3}$

5.  $\frac{6x^5 + 4x^4 - 6x^3 + 14x^2 - 8}{6x + 4}$

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

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

8.  $\frac{x^4 + 2x^3 + 2x^2 + 2x + 1}{x + 1}$

9. Use the results of Problems 7 and 8 to predict the quotient of  $\frac{x^5 + 2x^4 + 2x^3 + 2x^2 + 2x + 1}{x + 1}$ . Explain your prediction. Then check your prediction using the reverse tabular method.

10. Use the results of Exercise 5 in the Exploratory Challenge and Problems 7 through 9 above to predict the quotient of  $\frac{x^4 - 2x^3 + 2x^2 - 2x + 1}{x - 1}$ . Explain your prediction. Then check your prediction using the reverse tabular method.

11. Make and test a conjecture about the quotient of  $\frac{x^6 + x^5 + 2x^4 + 2x^3 + 2x^2 + x + 1}{x^2 + 1}$ . Explain your reasoning.

12. Given the following quotients:

$$\frac{4x^2 + 8x + 3}{2x + 1} \text{ and } \frac{483}{21}$$

- How are these expressions related?
- Find each quotient.
- Explain the connection between the quotients.