Lesson 3: The Division of Polynomials

Opening Exercise

* 1. Multiply these polynomials using the tabular method.

$$\left(2x+5\right)\left(x^{2}+5x+1\right)$$

* 1. How can you use the expression in part (a) to quickly multiply $25×151$?

Exploratory Challenge

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

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1. Describe the process you used to determine your answer to Exercise 1.
2. Reverse the tabular method of multiplication to find the quotient: $\frac{2x^{2}+x-10}{x-2}$.

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|  |  |  | $$x$$ |
| $$2x^{2}$$ |  |  | $$-2$$ |
| $$x$$ | $$-10$$ |  |  |

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

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

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

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

1. 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. $\left(2x^{3}+x^{2}-16x+15\right)÷\left(2x-3\right)$
2. $\left(3x^{5}+12x^{4}+11x^{3}+2x^{2}-4x-2\right)÷\left(3x^{2}-1\right)$
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. $\left(x^{3}-8\right)÷\left(x-2\right)$
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:

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

* 1. How are these expressions related?
	2. Find each quotient.
	3. Explain the connection between the quotients.