

# 12.3 Divide Polynomials

TEKS A.1.C, A.1.D

**Before**

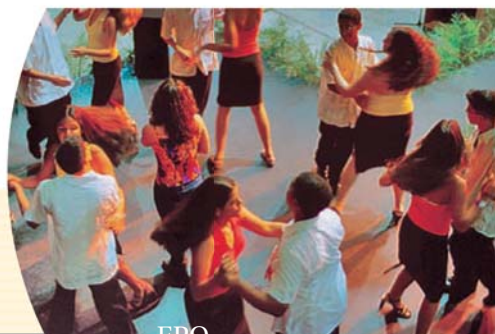
You multiplied polynomials.

**Now**

You will divide polynomials.

**Why?**

So you can describe an average cost, as in Ex. 43.



## Key Vocabulary

- **monomial**, p. 554
- **polynomial**, p. 554
- **binomial**, p. 555
- **rational function**, p. 775

Just as you can find the product of two polynomials, you can divide the product by one of the polynomials to obtain the other polynomial. For example,  $x^2 + 5x + 6 = (x + 2)(x + 3)$  is equivalent to  $\frac{x^2 + 5x + 6}{x + 2} = x + 3$ .

### EXAMPLE 1 Divide a polynomial by a monomial

Divide  $4x^3 + 8x^2 + 10x$  by  $2x$ .

#### Solution

**Method 1:** Write the division as a fraction.

$$(4x^3 + 8x^2 + 10x) \div 2x = \frac{4x^3 + 8x^2 + 10x}{2x} \quad \text{Write as fraction.}$$

$$= \frac{4x^3}{2x} + \frac{8x^2}{2x} + \frac{10x}{2x} \quad \text{Divide each term by } 2x.$$

$$= 2x^2 + 4x + 5 \quad \text{Simplify.}$$

**Method 2:** Use long division.

Think:  
 $4x^3 \div 2x = ?$

Think:  
 $8x^2 \div 2x = ?$

Think:  
 $10x \div 2x = ?$

$$\begin{array}{r} 2x^2 + 4x + 5 \\ 2x \overline{) 4x^3 + 8x^2 + 10x} \end{array}$$

►  $(4x^3 + 8x^2 + 10x) \div 2x = 2x^2 + 4x + 5$

**CHECK**  $2x(2x^2 + 4x + 5) \stackrel{?}{=} 4x^3 + 8x^2 + 10x$

$2x(2x^2) + 2x(4x) + 2x(5) \stackrel{?}{=} 4x^3 + 8x^2 + 10x$

$4x^3 + 8x^2 + 10x = 4x^3 + 8x^2 + 10x \quad \checkmark$



### GUIDED PRACTICE for Example 1

Divide.

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

2.  $(12y^4 - 16y^3 + 20y^2) \div 4y$