12-5 Dividing Polynomials (Pages 666–671)

To divide a polynomial by a *monomial*, divide each term of the polynomial by the monomial. To divide a polynomial by a *binomial*, first try factoring the dividend. If you cannot factor the dividend, use long division.

Examples

a. Find $(5x^2 - 3xy + 2y^2) \div 2xy$.

$$\frac{5x^2 - 3xy + 2y^2}{2xy} \qquad \text{Rewrite as a fraction.}$$

$$= \frac{5x^2}{2xy} - \frac{3xy}{2xy} + \frac{2y^2}{2xy} \qquad \text{Divide each term by 2xy.}$$

$$= \frac{5x}{2y} - \frac{3}{2} + \frac{y}{x} \qquad \text{Simplify each term.}$$

The quotient is $\dfrac{5x}{2y} - \dfrac{3}{2} + \dfrac{y}{x}$.

b. Find $(t^2 - 5t + 10) \div (t + 3)$.

Since the dividend, $t^2 - 5t + 10$, cannot be factored, use long division.

$$
\begin{array}{r}
t \\
t + 3 \overline{)\, t^2 - 5t + 10} \\
(-)\, \underline{t^2 + 3t} \\
-8t
\end{array}
\qquad
\begin{array}{l}
t^2 \div t = t \\
\text{Multiply } t \text{ and } t + 3. \\
\text{Subtract.}
\end{array}
$$

$$
\begin{array}{r}
t - 8 \\
t + 3 \overline{)\, t^2 - 5t + 10} \\
(-)\, \underline{t^2 + 3t} \\
-8t + 10 \\
(-)\, \underline{-8t - 24} \\
34
\end{array}
\qquad
\begin{array}{l}
 \\
 \\
 \\
\text{Multiply } -8 \text{ and } t + 3. \\
\text{Subtract.}
\end{array}
$$

The quotient is $t - 8$ with remainder 34 or $t - 8 + \dfrac{34}{t + 3}$.

Try These Together

1. Find $(x^3 + 4x - 8) \div 2x$.

HINT: Divide each term of the dividend by 2x.

2. Find $(y^2 + 7y + 10) \div (y + 2)$.

HINT: Factor the dividend, $y^2 + 7y + 10$.

Practice

Find each quotient.

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

4. $(x^2 + 7x + 10) \div (x + 2)$

5. $(x^2 - 5x + 6) \div (x - 3)$

6. $(a^2 - 3a - 4) \div (a + 1)$

7. $(2y^2 + 10y + 8) \div (y + 4)$

8. $(x^2 + 8x + 14) \div (x + 1)$

9. $(2b^2 - 5b + 8) \div (b - 2)$

10. $(2x^2 + 9x + 3) \div (x + 3)$

11. $\dfrac{t^2 - 6t + 16}{8t}$

12. $\dfrac{2n^2 + 6n + 3}{n + 3}$

13. $\dfrac{x^2 + 5x + 6}{x + 1}$

14. $\dfrac{6x^2 + x - 10}{2x - 3}$

15. $\dfrac{y^3 - 4y^2 + 2y + 8}{y + 1}$

16. $\dfrac{x^3 + x - 2}{x - 1}$

17. **Standardized Test Practice** Find $(3x^2 + 6x + 9) \div 3x$.

A $3x + 3$ **B** $3x + 2$ **C** $x + 3 + \dfrac{3}{x}$ **D** $x + 2 + \dfrac{3}{x}$

Answers: 1. $\dfrac{x^2}{2} + 2 - \dfrac{4}{x}$ 2. $y + 5$ 3. $\dfrac{k}{3} - 4 + \dfrac{2}{k}$ 4. $x + 5$ 5. $x - 2$ 6. $a - 4$ 7. $2y + 2$ 8. $x + 7 + \dfrac{7}{x + 1}$ 9. $2b - 1 + \dfrac{6}{b - 2}$ 10. $2x + 3 + \dfrac{3}{x + 3}$ 11. $\dfrac{t}{8} - \dfrac{3}{4} + \dfrac{2}{t}$ 12. $2n + \dfrac{3}{n + 3}$ 13. $x + 4 + \dfrac{2}{x + 1}$ 14. $3x + 5 + \dfrac{5}{2x - 3}$ 15. $y^2 - 5y + 7 + \dfrac{1}{y + 1}$ 16. $x^2 + x + 2$ 17. D