Lesson 18: Overcoming a Second Obstacle in Factoring—What If There Is a Remainder?

Classwork

Opening Exercise

Write the rational number $\frac{13}{4}$ as a mixed number.

Example 1

a. Find the quotient by factoring the numerator.

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

b. Find the quotient.

$$\frac{x^2+3x+5}{x+2}$$

Example 2

a. Find the quotient by factoring the numerator.

$$\frac{x^3 - 8}{x - 2}$$

b. Find the quotient.

$$\frac{x^3 - 4}{x - 2}$$

Exercises 1–10

Find each quotient by inspection.

1. $\frac{x + 4}{x + 1}$

2. $\frac{2x - 7}{x - 3}$

3. $\frac{x^2 - 21}{x + 4}$

Find each quotient by using the reverse tabular method.

4. $\frac{x^2 + 4x + 10}{x - 8}$

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

6. $\frac{x^2 - 2x - 19}{x - 1}$

Find each quotient by using long division.

7. $\frac{x^2 - x - 25}{x + 6}$

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

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

Rewrite the numerator in the form $(x-h)^2+k$ by completing the square. Then find the quotient.

10. $\dfrac{x^2+4x-9}{x+2}$

Mental Math Exercises

$\dfrac{x^2-9}{x+3}$	$\dfrac{x^2-4x+3}{x-1}$	$\dfrac{x^2-16}{x+4}$	$\dfrac{x^2-3x-4}{x+1}$
$\dfrac{x^3-3x^2}{x-3}$	$\dfrac{x^4-x^2}{x^2-1}$	$\dfrac{x^2+x-6}{x+3}$	$\dfrac{x^2-4}{x+2}$
$\dfrac{x^2-8x+12}{x-2}$	$\dfrac{x^2-36}{x+6}$	$\dfrac{x^2+6x+8}{x+4}$	$\dfrac{x^2-4}{x-2}$
$\dfrac{x^2-x-20}{x+4}$	$\dfrac{x^2-25}{x+5}$	$\dfrac{x^2-2x+1}{x-1}$	$\dfrac{x^2-3x+2}{x-2}$
$\dfrac{x^2+4x-5}{x-1}$	$\dfrac{x^2-25}{x-5}$	$\dfrac{x^2-10x}{x}$	$\dfrac{x^2-12x+20}{x-2}$
$\dfrac{x^2+5x+4}{x+4}$	$\dfrac{x^2-1}{x-1}$	$\dfrac{x^2+16x+64}{x+8}$	$\dfrac{x^2+9x+8}{x+1}$

Problem Set

1. For each pair of problems, find the first quotient by factoring the numerator. Then, find the second quotient by using the first quotient.

   a. $\dfrac{3x-6}{x-2}$ $\qquad$ $\dfrac{3x-9}{x-2}$

   b. $\dfrac{x^2-5x-14}{x-7}$ $\qquad$ $\dfrac{x^2-5x+2}{x-7}$

   c. $\dfrac{x^3+1}{x+1}$ $\qquad$ $\dfrac{x^3}{x+1}$

   d. $\dfrac{x^2-13x+36}{x-4}$ $\qquad$ $\dfrac{x^2-13x+30}{x-4}$

Find each quotient by using the reverse tabular method.

2. $\dfrac{x^3-9x^2+5x+2}{x-1}$

3. $\dfrac{x^2+x+10}{x+12}$

4. $\dfrac{2x+6}{x-8}$

5. $\dfrac{x^2+8}{x+3}$

Find each quotient by using long division.

6. $\dfrac{x^4-9x^2+10x}{x+2}$

7. $\dfrac{x^5-35}{x-2}$

8. $\dfrac{x^2}{x-6}$

9. $\dfrac{x^3+2x^2+8x+1}{x+5}$

10. $\dfrac{x^3+2x+11}{x-1}$

11. $\dfrac{x^4+3x^3-2x^2+6x-15}{x}$

12. Rewrite the numerator in the form $(x-h)^2+k$ by completing the square. Then, find the quotient.

$$\frac{x^2-6x-10}{x-3}$$