Chapter 7

Division and the Remainder Theorem

Lesson 7-3 (pp. 453-458)

Mental Math

a. $\frac{10}{21}$

b. $\frac{10}{21x^3}$

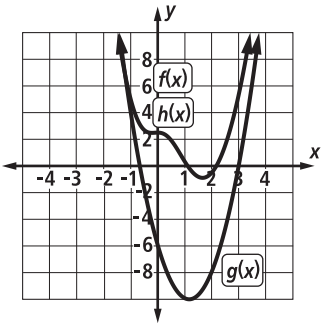
c. $\frac{5}{21}$

Guided Example 2

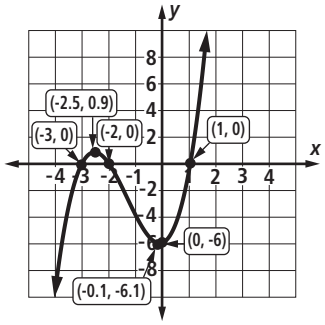
3, 7, 6; 3; 3; –7; –7; –6; –6; 3, 7, 6; 3, 7, 6;

Questions

1. $2x + 3$
2. $4z^2 - z - 2 - \frac{2z + 4}{2z^2 + 1}$
3. a. $x^2 + 7x - 1$
   b. $x - 4$
4. Answers vary. Sample: dividend = quotient • divisor + remainder; $\frac{\text{dividend}}{\text{divisor}} = \text{quotient} + \frac{\text{remainder}}{\text{divisor}}$
5. Answers vary. Sample: $q(x) = x$, $r(x) = 13$
6. dividend: $3b^5 + 16b^3 - 27b - 50$; divisor: $b^3 - 7$; quotient: $3b^2 + 16$; remainder: $21b^2 - 27b + 62$
7. a. –13
   b.
$$\begin{array}{r} y^2 - 9 \\ y + 3 \overline{)\, y^3 + 3y^2 - 9y - 40} \\ \underline{y^3 + 3y^2} \\ -9y - 40 \\ \underline{-9y - 27} \\ -13 \end{array}$$
8. a. –465
   b.
$$\begin{array}{r} 2x^2 - 19x + 94 \\ x + 5 \overline{)\, 2x^3 - 9x^2 - x + 5} \\ \underline{2x^3 + 10x^2} \\ -19x^2 - x \\ \underline{-19x^2 - 95x} \\ 94x + 5 \\ \underline{94x + 470} \\ -465 \end{array}$$
9. 0
10. $x^6 + 2x^5 + 4x^4 + 8x^3 + 16x^2 + 32x + 64$
11. a. $q(a) = 3a + 5$; $r(a) = 12a + 10$
    b. degree of remainder = 1
    degree of divisor = 2
    c. $(3a + 5)(a^2 - 4) + (12a + 10) = 3a^3 + 5a^2 - 10$
12. a. $q(x) = x^3 - 3x^2 + 8x + 22$; $r(x) = 63$
    b. degree of remainder = 0
    degree of divisor = 1
    c. $(x^3 - 3x^2 + 8x + 22)(x - 3) + 63 = x^4 - 6x^3 + 17x^2 - 2x - 3$
13. $x^2 + 3xy + y^2$
14. a. true
    b. As long as $x^2 - 6x + 9$ doesn't equal zero, $g(x) = x - 3$.
15. a.



    b. Answers vary. Sample: The graphs of $f(x)$ and $h(x)$ are identical. The graph of $g(x)$ differs from them both, particularly about the origin, suggesting that the remainder is important to describing the behavior of the function.
16. a. 1st differences: –1, 5, 17, 35, 59, 89; 2nd differences: 6, 12, 18, 24, 30; 3rd differences: 6, 6, 6, 6. The 3rd differences are constant, so h is a polynomial of degree 3.
    b. $h(z) = z^3 - 2z + 3$
    c. 332
17. a.



    b. $-3 < s < -2$ and $s > 1$
    c. $s < -3$ and $-2 < s < 1$
    d. $s < -2.5$ and $s > -0.1$
    e. $-2.5 < s < -0.1$
18. approximately (–0.155, –0.079), (2.155, 6.079)

19. $7! = 5040$
20. $XZ \approx 0.57$ miles, and $YZ \approx 0.43$ miles
21. a. $x = 0$ or $x = -8$
    b. $y = 4$ or $y = 7$
    c. $z = 6$, $z = -2$, or $z = -11$
22. a. i. $x^2 + xy + y^2$
    ii. $x^4 + x^3y + x^2y^2 + xy^3 + y^4$
    iii. $x^6 + x^5y + x^4y^2 + x^3y^3 + x^2y^4 + xy^5 + y^6$
    iv. $x^8 + x^7y + x^6y^2 + x^5y^3 + x^4y^4 + x^3y^5 + x^2y^6 + xy^7 + y^8$
    b. $\frac{x^n - y^n}{x - y} = \sum_{i=0}^{n-1} x^{n-1-i}y^i$