Name _____ Date _____

4.1 Extra Practice

In Exercises 1–4, determine whether the function is a polynomial function. If so, write it in standard form and state its degree, type, and leading coefficient.

1. $h(x) = 6x^3 - 9x^{-3} + x^2 - 5x - 1$

2. $f(x) = 11x^2 - \sqrt{7} + 12x$

3. $g(x) = 2x^4 - \frac{1}{3}x^2 - \sqrt{14}x^3 + 2x - \frac{5}{3}$

4. $f(x) = 2x^3 + 9x^2 - 5x + \frac{4}{x} - 1$

In Exercises 5–7, evaluate the function for the given value of x.

5. $f(x) = -x^3 + 5x^2 + 9x + 4;\ x = -11$

6. $g(x) = 3x^3 + 6x^2 + 12x - 10;\ x = \frac{1}{3}$

7. $h(x) = 9x^3 - 8x^2 + 11x + 8;\ x = -\frac{1}{2}$

In Exercises 8 and 9, describe the end behavior of the function.

8. $g(x) = -5x^4 + 7x^3 - 7x^6 + x^2 - 9x + 2$

9. $h(x) = -2x^3 + 5x^2 + 4x^5 - 3x^4 + 12x^2 - 4$

In Exercises 10–13, graph the polynomial function.

10. $q(x) = x^4 - x^3 - 5x^2$

11. $h(x) = 4 - 2x^2 - x^4$

12. $k(x) = x^5 - 2x^4 + x - 2$

13. $f(x) = x^6 - 3x^5 + 2x^3 + x + 1$

In Exercises 14 and 15, sketch a graph of the polynomial function f with the given characteristics. Use the graph to describe the degree and leading coefficient of the function f.

14. f is increasing when $x < 1$; f is decreasing when $x > 1$.

    $f(x) > 0$ when $-1 < x < 3$; $f(x) < 0$ when $x < -1$ and $x > 3$.

15. f is increasing when $x < -1.1$ and $x > 2.4$; f is decreasing when $-1.1 < x < 2.4$.

    $f(x) > 0$ when $-2 < x < 0$ and $x > 4$; $f(x) < 0$ when $x < -2$ and $0 < x < 4$.

16. The function $h(t) = -4.9t^2 + 28.62t + 2.4$ models the height h of a high pop-up hit by a baseball player after t seconds. Use technology to graph the function. State an appropriate window to view the maximum height of the ball and when the ball hits the ground.

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4.2 Extra Practice

In Exercises 1 and 2, find the sum.

1. $(8x^7 - 6x^5 + 4x^3 - 6x) + (15x^6 + 4x^5 - 3x^3 + 2)$

2. $(8x^4 - 2x^3 + 9x^2 + 7x + 14) + (6x^4 - 5x^3 - 9x^2 - 11x - 9)$

In Exercises 3 and 4, find the difference.

3. $(9x^5 + 5x^4 - 9x^2 + 10x) - (12x^5 + 2x^4 - x^2 - 9)$

4. $(12x^4 - 6x^2 + 2x + 14) - (3x^4 - 5x^3 + 9x + 3)$

In Exercises 5–8, find the product.

5. $(x^2 - 7x - 2)(x^2 - 3x - 6)$

6. $(2x^2 + 3x - 1)(-5x^2 - 2x + 4)$

7. $(4x^2 - 3x + 6)(x^2 - 2x + 2)$

8. $(3x^2 - 6x - 5)(x^4 + 2x^2 + 5x)$

9. Describe and correct the error in performing the operation.

$\times$ $4x^2(3x^4 - 2x^3 + 7) = 12x^8 - 8x^6 + 28x^2$

In Exercises 10–13, find the product of the binomials.

10. $(x - 3)(2x + 2)(3x - 1)$

11. $(2x + 3)(x - 5)(4x + 1)$

12. $(2x - 1)(3 - 2x)(4x + 5)$

13. $(5 - 2x)(2 - x)(4x + 3)$

In Exercises 14–16, find the product.

14. $(3x + 5)(3x - 5)$

15. $(6t + 7)^2$

16. $(pq + 2)^2$

17. A rectangular pool has a level floor. The length of the pool is $(3x - 1)$ feet, the width of the pool is $(x + 6)$ feet, and the depth of the pool is $(x + 6)$ feet.

    a. Write an expression for the volume of the pool as a product of binomials.

    b. Write an expression for the volume of the pool as a polynomial in standard form.