3.1 EXERCISE SET

Determine the leading term, the leading coefficient, and the degree of the polynomial. Then classify the polynomial as constant, linear, quadratic, cubic, or quartic.

1. $g(x) = \frac{1}{2}x^3 - 10x + 8$
2. $f(x) = 15x^2 - 10 + 0.11x^4 - 7x^3$
3. $h(x) = 0.9x - 0.13$
4. $f(x) = -6$
5. $g(x) = 305x^4 + 4021$
6. $h(x) = 2.4x^3 + 5x^2 - x + \frac{7}{8}$
7. $h(x) = -5x^2 + 7x^3 + x^4$
8. $f(x) = 2 - x^2$
9. $g(x) = 4x^3 - \frac{1}{2}x^2 + 8$
10. $f(x) = 12 + x$

In Exercises 11–18, select one of the following four sketches to describe the end behavior of the graph of the function.

a) 

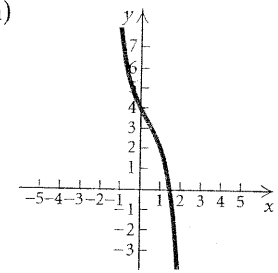
b) 

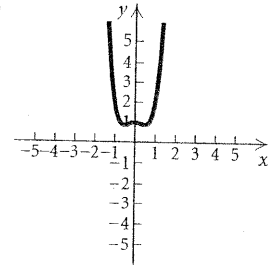
c) 

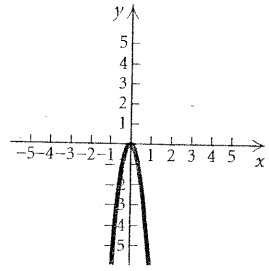
d) 

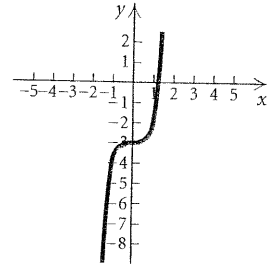
11. $f(x) = -3x^3 - x + 4$
12. $f(x) = \frac{1}{4}x^4 + \frac{1}{2}x^3 - 6x^2 + x - 5$
13. $f(x) = -x^6 + \frac{3}{4}x^4$
14. $f(x) = \frac{2}{5}x^5 - 2x^4 + x^3 - \frac{1}{2}x + 3$
15. $f(x) = -3.5x^4 + x^6 + 0.1x^7$
16. $f(x) = -x^3 + x^5 - 0.5x^6$
17. $f(x) = 10 + \frac{1}{10}x^4 - \frac{2}{5}x^3$
18. $f(x) = 2x + x^3 - x^5$

In Exercises 19–22, use the leading-term test to match the function with one of the graphs (a)–(d), which follow.

a) 

b) 

c) 

d) 

19. $f(x) = -x^6 + 2x^5 - 7x^2$
20. $f(x) = 2x^4 - x^2 + 1$
21. $f(x) = x^5 + \frac{1}{10}x - 3$
22. $f(x) = -x^3 + x^2 - 2x + 4$
23. Use substitution to determine whether 4, 5, and -2 are zeros of

$$f(x) = x^3 - 9x^2 + 14x + 24.$$

24. Use substitution to determine whether 2, 3, and -1 are zeros of

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

25. Use substitution to determine whether 2, 3, and -1 are zeros of

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

26. Use substitution to determine whether 1, -2, and 3 are zeros of

$$g(x) = x^4 - x^3 - 3x^2 + 5x - 2.$$

Find the zeros of the polynomial function and state the multiplicity of each.

27. $f(x) = (x + 3)^2(x - 1)$
28. $f(x) = (x + 5)^3(x - 4)(x + 1)^2$
29. $f(x) = -2(x - 4)(x - 4)(x - 4)(x + 6)$
30. $f(x) = \left(x + \frac{1}{2}\right)(x + 7)(x + 7)(x + 5)$
31. $f(x) = (x^2 + 9)^3$
32. $f(x) = (x^2 - 4)^2$
33. $f(x) = x^3(x - 1)^2(x + 4)$
34. $f(x) = x^2(x + 3)^2(x - 4)(x + 1)^4$
35. $f(x) = -8(x - 3)^2(x + 4)^3x^4$
36. $f(x) = (x^2 - 5x + 6)^2$
37. $f(x) = x^4 - 4x^2 + 3$
38. $f(x) = x^4 - 10x^2 + 9$
39. $f(x) = x^3 + 3x^2 - x - 3$
40. $f(x) = x^3 - x^2 - 2x + 2$
41. $f(x) = 2x^3 - x^2 - 8x + 4$
42. $f(x) = 3x^3 + x^2 - 48x - 16$

In Exercises 43–46, determine whether the statement is true or false.

43. If $P(x) = (x - 3)^4(x + 1)^3$, then the graph of the polynomial function $y = P(x)$ crosses the x-axis at $(3, 0)$. False
44. If $P(x) = (x + 2)^2\left(x - \frac{1}{4}\right)^5$, then the graph of the polynomial function $y = P(x)$ crosses the x-axis at $\left(\frac{1}{4}, 0\right)$. True
45. If $P(x) = (x - 2)^3(x + 5)^6$, then the graph of $y = P(x)$ is tangent to the x-axis at $(-5, 0)$.