

GUIDED PRACTICE

Vocabulary Check ✓

1. Identify the degree, type, leading coefficient, and constant term of the polynomial function $f(x) = 5x - 2x^3$.

Concept Check ✓

2. Complete the synthetic substitution shown at the right. Describe each step of the process.

-2	3	1	-9	2
	?	?	?	?
	3	?	?	0

3. Describe the graph of a constant function.

Skill Check ✓

Decide whether each function is a polynomial function. If it is, use synthetic substitution to evaluate the function when $x = -1$.

4. $f(x) = x^4\sqrt{5} - x$

5. $f(x) = x^3 + x^2 - x^{-3} + 3$

6. $f(x) = 6^{2x} - 12x$

7. $f(x) = 14 - 21x^2 + 5x^4$

Describe the end behavior of the graph of the polynomial function by completing the statements $f(x) \rightarrow ?$ as $x \rightarrow -\infty$ and $f(x) \rightarrow ?$ as $x \rightarrow +\infty$.

8. $f(x) = x^3 - 5x$

9. $f(x) = -x^5 - 3x^3 + 2$

10. $f(x) = x^4 - 4x^2 + x$

11. $f(x) = x + 12$

12. $f(x) = -x^2 + 3x + 1$

13. $f(x) = -x^8 + 9x^5 - 2x^4$

14. **VIDEO RENTALS** The total revenue (actual and projected) from home video rentals in the United States from 1985 to 2005 can be modeled by

$$R = 1.8t^3 - 76t^2 + 1099t + 2600$$

where R is the revenue (in millions of dollars) and t is the number of years since 1985. Graph the function. **Source:** *The Wall Street Journal Almanac*

PRACTICE AND APPLICATIONS

STUDENT HELP

→ **Extra Practice** to help you master skills is on p. 947.

CLASSIFYING POLYNOMIALS Decide whether the function is a polynomial function. If it is, write the function in standard form and state the degree, type, and leading coefficient.

15. $f(x) = 12 - 5x$

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

17. $f(x) = x + \pi$

18. $f(x) = x^2\sqrt{2} + x - 5$

19. $f(x) = x - 3x^{-2} - 2x^3$

20. $f(x) = -2$

21. $f(x) = x^2 - x + 1$

22. $f(x) = 22 - 19x + 2^x$

23. $f(x) = 36x^2 - x^3 + x^4$

24. $f(x) = 3x^2 - 2x^{-x}$

25. $f(x) = 3x^3$

26. $f(x) = -6x^2 + x - \frac{3}{x}$

DIRECT SUBSTITUTION Use direct substitution to evaluate the polynomial function for the given value of x .

27. $f(x) = 2x^3 + 5x^2 + 4x + 8, x = -2$

28. $f(x) = 2x^3 - x^4 + 5x^2 - x, x = 3$

29. $f(x) = x + \frac{1}{2}x^3, x = 4$

30. $f(x) = x^2 - x^5 + 1, x = -1$

31. $f(x) = 5x^4 - 8x^3 + 7x^2, x = 1$

32. $f(x) = x^3 + 3x^2 - 2x + 5, x = -3$

33. $f(x) = 11x^3 - 6x^2 + 2, x = 0$

34. $f(x) = x^4 - 2x + 7, x = 2$

35. $f(x) = 7x^3 + 9x^2 + 3x, x = 10$

36. $f(x) = -x^5 - 4x^3 + 6x^2 - x, x = -2$

STUDENT HELP

→ HOMEWORK HELP

Example 1: Exs. 15–26

Example 2: Exs. 37–46

Example 3: Exs. 81, 82

Example 4: Exs. 47–79

Example 5: Exs. 83–86

SYNTHETIC SUBSTITUTION Use synthetic substitution to evaluate the polynomial function for the given value of x .

37. $f(x) = 5x^3 + 4x^2 + 8x + 1, x = 2$ 38. $f(x) = -3x^3 + 7x^2 - 4x + 8, x = 3$
 39. $f(x) = x^3 + 3x^2 + 6x - 11, x = -5$ 40. $f(x) = x^3 - x^2 + 12x + 15, x = -1$
 41. $f(x) = -4x^3 + 3x - 5, x = 2$ 42. $f(x) = -x^4 + x^3 - x + 1, x = -3$
 43. $f(x) = 2x^4 + x^3 - 3x^2 + 5x, x = -1$ 44. $f(x) = 3x^5 - 2x^2 + x, x = 2$
 45. $f(x) = 2x^3 - x^2 + 6x, x = 5$ 46. $f(x) = -x^4 + 8x^3 + 13x - 4, x = -2$

END BEHAVIOR PATTERNS Graph each polynomial function in the table. Then copy and complete the table to describe the end behavior of the graph of each function.

47.

Function	As $x \rightarrow -\infty$	As $x \rightarrow +\infty$
$f(x) = -5x^3$?	?
$f(x) = -x^3 + 1$?	?
$f(x) = 2x - 3x^3$?	?
$f(x) = 2x^2 - x^3$?	?

48.

Function	As $x \rightarrow -\infty$	As $x \rightarrow +\infty$
$f(x) = x^4 + 3x^3$?	?
$f(x) = x^4 + 2$?	?
$f(x) = x^4 - 2x - 1$?	?
$f(x) = 3x^4 - 5x^2$?	?

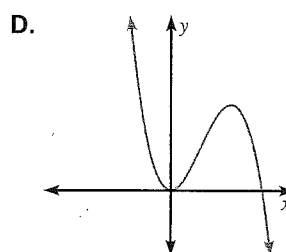
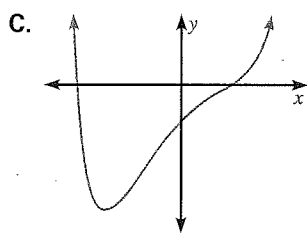
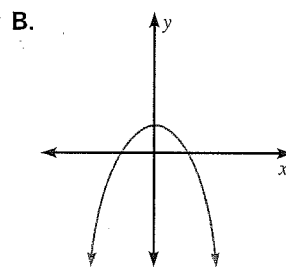
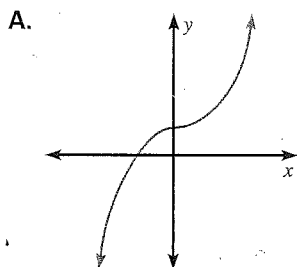
MATCHING Use what you know about end behavior to match the polynomial function with its graph.

49. $f(x) = 4x^6 - 3x^2 + 5x - 2$

50. $f(x) = -2x^3 + 5x^2$

51. $f(x) = -x^4 + 1$

52. $f(x) = 6x^3 + 1$



DESCRIBING END BEHAVIOR Describe the end behavior of the graph of the polynomial function by completing these statements: $f(x) \rightarrow ?$ as $x \rightarrow -\infty$ and $f(x) \rightarrow ?$ as $x \rightarrow +\infty$.

53. $f(x) = -5x^4$

54. $f(x) = -x^2 + 1$

55. $f(x) = 2x$

56. $f(x) = -10x^3$

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

58. $f(x) = x^5 + 2x^2$

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

60. $f(x) = x^7 - 3x^3 + 2x$

61. $f(x) = 3x^6 - x - 4$

62. $f(x) = 3x^8 - 4x^3$

63. $f(x) = -6x^3 + 10x$

64. $f(x) = x^4 - 5x^3 + x - 1$