

Answers for 5.7

For use with pages 383–386

5.7 Skill Practice

1. repeated
2. Complex conjugates include imaginary numbers and irrational conjugates include irrational numbers.
3. 4
4. 3
5. 6
6. 4
7. 7
8. 12
9. D
10. $-1, 1, 2, 4$
11. $-5, -3, 1, 2$
12. $-2, 1, 3$
13. $-5, -2, 2$
14. $-1, 1, 4i, -4i$
15. $-2, 1, 2i, -2i$
16. $-3, -1, 2i, -2i$
17. $-\sqrt{3}, -\frac{1}{2}, \sqrt{3}$
18. $i, -i, 1 + \sqrt{3}, 1 - \sqrt{3}$
19. $-4, -2, -\frac{3}{2}, 1$
20. $f(x) = x^3 - 6x^2 + 11x - 6$
21. $f(x) = x^3 - 2x^2 - 5x + 6$
22. $f(x) = x^3 + 4x^2 - 7x - 10$
23. $f(x) = x^3 - 4x^2 - 15x + 18$
24. $f(x) = x^3 - 2x^2 + x - 2$

25. $f(x) = x^4 - 4x^3 + 14x^2 - 36x + 45$
26. $f(x) = x^4 - x^3 + 7x^2 - 9x - 18$
27. $f(x) = x^4 - 18x^3 + 122x^2 - 370x + 425$
28. $f(x) = x^3 - 4x^2 - 5x + 20$
29. $f(x) = x^4 - x^3 - 18x^2 + 10x + 8$
30. $f(x) = x^6 - 2x^5 - 18x^4 + 30x^3 + 89x^2 - 88x - 132$
31. $f(x) = x^5 - 13x^4 + 60x^3 - 82x^2 - 144x + 360$
32. The conjugate of $1 + i, 1 - i$, must also be a zero;
 $f(x) = (x - 2)[x - (1 + i)] \cdot [x - (1 - i)] = (x - 2) \cdot (x^2 - 2x + 2) = x^3 - 4x^2 + 6x - 4.$
33. *Sample answer:*
 $f(x) = x^5 - 4x^4 + 6x^3 - 6x^2 + 5x - 2$
34. positive: 1, negative: 1, imaginary: 2
35. positive: 1, negative: 0, imaginary: 2
36. positive: 2 or 0, negative: 1, imaginary: 2 or 0

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- 37.** positive: 2 or 0, negative: 3 or 1, imaginary: 4, 2, or 0
- 38.** positive: 3 or 1, negative: 2 or 0, imaginary: 4, 2, or 0
- 39.** positive: 3 or 1, negative: 2 or 0, imaginary: 4, 2, or 0
- 40.** positive: 3 or 1, negative: 3 or 1, imaginary: 4, 2, or 0
- 41.** positive: 2 or 0, negative: 1, imaginary: 6 or 4
- 42.** $x \approx -2.7, x \approx 0.61, x \approx 3.1$
- 43.** $x \approx -1.1, x \approx 1.3$
- 44.** $x \approx -1.1$
- 45.** $x \approx -0.58, x \approx 1.9$
- 46.** $x \approx -1.4, x \approx 0.72, x = 1$
- 47.** $x \approx -0.42, x \approx 2.0$
- 48.** $x \approx -1.0, x \approx 1.0$
- 49.** $x \approx -3.5, x \approx -1.1, x = -1, x \approx 2.1, x \approx 3.6$
- 50.** It cannot be imaginary because there are three total zeros and if one is imaginary, its conjugate also has to be a zero.
- 51.** There could be 3, 2, 1, or 0 positive zeros, 3, 2, 1, or 0 negative zeros, and 2 or 0 imaginary zeros.
- 52.** C
- 53.** Positive real zeros: 1, negative real zeros: 2, imaginary zeros: 0; the graph crosses the positive x -axis once and the negative x -axis twice.
- 54.** Positive real zeros: 1, negative real zeros: 1, imaginary zeros: 2; the graph crosses the positive x -axis once and the negative x -axis once. Since the function has degree 4, the remaining 2 zeros must be imaginary.
- 55.** Positive real zeros: 0, negative real zeros: 1, imaginary zeros: 4; the graph does not cross the positive x -axis and it crosses the negative x -axis once. Since the function has degree 5, the remaining 4 zeros must be imaginary.
- 56.** $f(2 - i) = (2 - i)^3 - 2(2 - i)^2 + 2(2 - i) + 5i =$
 $2 - 11i - 6 + 8i + 4 - 2i + 5i = 0,$
so $2 - i$ is a zero;
 $f(2 + i) = (2 + i)^3 - 2(2 + i)^2 + 2(2 + i) + 5i =$
 $2 + 11i - 6 - 8i + 4 + 2i + 5i = 10i,$
so $2 + i$ is not a zero.

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57. $f(-1 + i) = (-1 + i)^3 + 2(-1 + i)^2 + 2i - 2 = 2 + 2i - 4i + 2i - 2 = 0,$
so $-1 + i$ is a zero;

$f(-1 - i) = (-1 - i)^3 + 2(-1 - i)^2 + 2i - 2 = 2 - 2i + 4i + 2i - 2 = 4i,$
so $-1 - i$ is not a zero.

58. The function is not a polynomial with real coefficients.

5.7 Problem Solving

59. year 3 and year 9

60. 1999

61. about 16.4 g per 100 mL

62. 1963

63. 0 in., about 59 in.; the bookshelf would have nearly 0 inches of deflection near each end because of the supports holding the bookshelf, so the answers make sense because they represent each end of a 60 inch bookshelf.

64. a. row 2: $1000g, 1000g^2;$
row 3: $1000g$

b. $v = 1000g^3 + 1000g^2 + 1000g + 1000$

c. About 1.048; about 4.8%; first I substituted \$4300 for v into the function in part (b) to get about 1.048. Then I subtracted 1 from the growth rate and changed it to a percent to find the interest rate.

65. about 4.3 ft

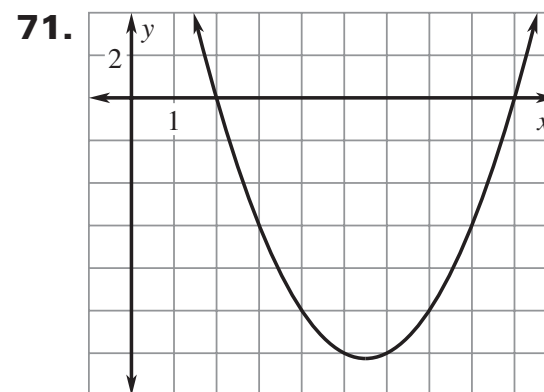
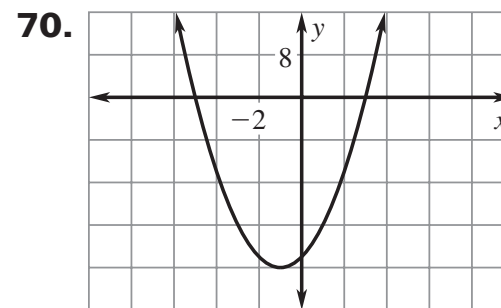
5.7 Mixed Review

66. -53

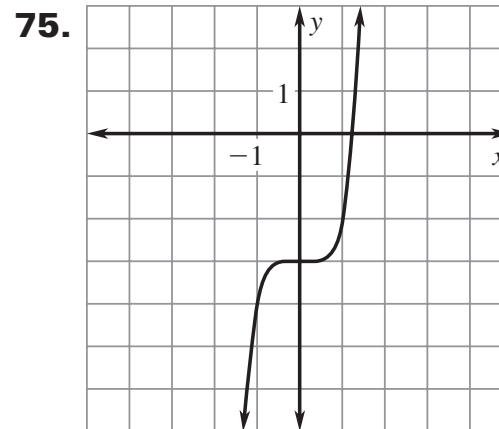
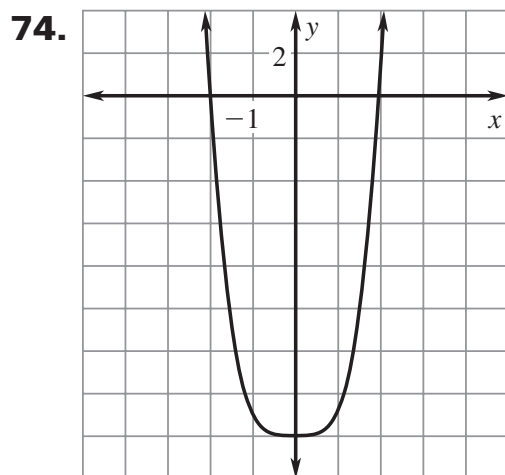
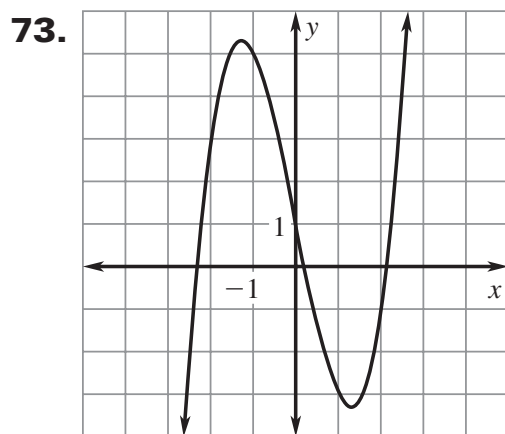
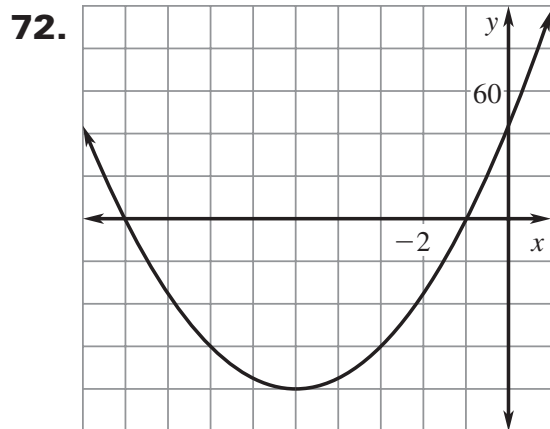
67. -8

68. -24

69. -18



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76. $y = \frac{1}{2}(x + 2)(x - 4)$

77. $y = -2(x + 5)(x + 1)$

78. $y = \frac{1}{3}(x - 2)(x - 7)$