Algebra 2
Lesson 5-1 - Practice and Problem-Solving Exercises Answers

8. $10x + 5$
The polynomial has degree 1 and 2 terms.
It is a linear binomial.

9. $-3x + 5$
The polynomial has degree 1 and 2 terms.
It is a linear binomial.

10. $2m^2 + 7m - 3$
The polynomial has degree 2 and 3 terms.
It is a quadratic trinomial.

11. $x^4 - x^3 + x$
The polynomial has degree 4 and 3 terms.
It is a quartic trinomial.

12. $2p^2 - p$
The polynomial has degree 2 and 2 terms.
It is a quadratic binomial.

13. $3a^3 + 5a^2 + 1$
The polynomial has degree 3 and 3 terms.
It is a cubic trinomial.

14. $-x^5$
The expression has degree 1 and term 1.
It is a quintic monomial.

15. $12x^4 + 3$
The polynomial has degree 4 and 2 terms.
It is a quartic binomial.

16. $5x^3$
The expression has degree 3 and 1 term.
It is a cubic monomial.

17. $-2x^3$
The expression has degree 3 and 1 term.
It is a cubic monomial.

18. $5x^2 + 4x + 8$
The polynomial has degree 2 and 3 terms.
It is a quadratic trinomial.

19. $-x^4 + 3x^2$
The polynomial has degree 4 and 2 terms.
It is a quartic binomial.

20. $y = -7x^3 + 8x^2 + x$
The leading term is $-7x^3$. Since n is odd and a is negative, the end behavior is up and down.

21. $y = 6x^2 - 3x - 1$
The leading term is $6x^2$. Since n is even and a is positve, the end behavior is up and up.

22. $y = -15x^6 - 6x^3 - 4x + 1$
The leading term is $-15x^6$. Since n is even and a is negative, the end behavior is down and down.

23. $y = 8x^{11} - 2x^9 + 3x^6 + 4$
The leading term is $8x^{11}$. Since n is odd and a is positive, the end behavior is down and up.

24. The end behavior is up and down.

25. The end behavior is down and down.

26. The end behavior is up and up.

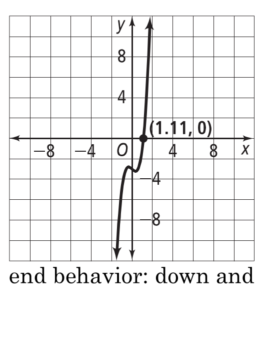
27. The end behavior is up and down.

28. The end behavior is down and down.

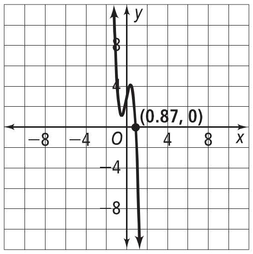
29. The end behavior is up and down.

30. The end behavior is down and up.

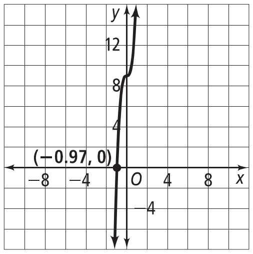
31. The end behavior is up and up.

32.


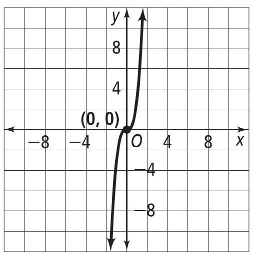
end behavior: down and up; two turning points

33. 

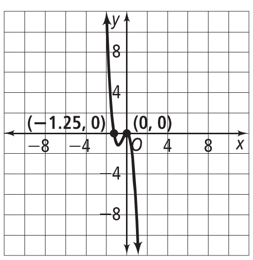
end behavior: up and down; two turning points

34. 

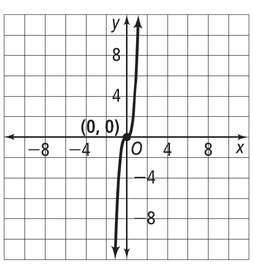
end behavior: down and up; no turning points

35. 

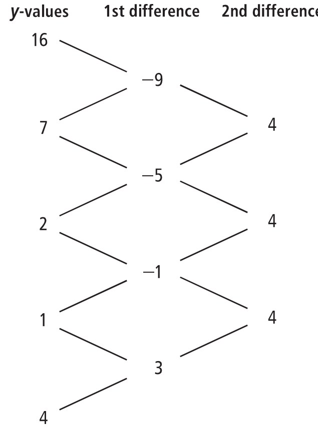
end behavior: down and up; no turning points

36. 

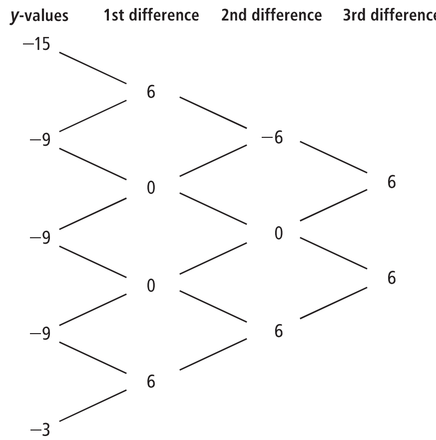
end behavior: up and down; two turning points

37. 

end behavior: down and up; no turning points

38. 

The numbers of the 2nd difference are equal, so the degree of the function is 2.

39. 

The numbers of the 3rd difference are equal, so the degree of the function is 3.

40. The differences are not approximately constant until the 3rd difference. The degree of the polynomial is 3.

41. degree 4, and 3 terms
quartic trinomial

42. degree 0, and 1 term
constant monomial

43. degree 2, and 1 term
quadratic monomial

44. cubic polynomial of 4 terms

45. cubic binomial

46. cubic trinomial

47. End behavior is up and down, so n must be odd and a must be negative. The graph has no turning points so the degree of the polynomial function is 3.

48. End behavior is down and up, so n must be odd and a must be positive. The graph has two turning points so the degree of the polynomial function is 3.

49. End behavior is down and down, so n must be even and a must be negative. The graph has three turning points so the degree of the polynomial function is 4.

50. Answers may vary. Sample:
$x^4 - 10x^2 + 9$

51. For $f(x) = x^3 - 3x^2 - 2x - 6$,

x	f(x)	1st diff	2nd diff	3rd diff
0	−6			
1	−10	−4		
2	−14	−4	0	
3	−12	2	6	6
4	2	14	12	6
5	34	32	18	6

For $f(x) = ax^3 + bx^2 + cx + d$,

x	f(x)	1st diff	2nd diff	3rd diff
0	d			
1	$a + b + c + d$	$a + b + c$		
2	$8a + 4b + 2c + d$	$7a + 3b + c$	$6a + 2b$	
3	$27a + 9b + 3c + d$	$19a + 5b + c$	$12a + 2b$	$6a$
4	$64a + 16b + 4c + d$	$37a + 7b + c$	$18a + 2b$	$6a$
5	$125a + 25b + 5c + d$	$61a + 9b + c$	$24a + 2b$	$6a$

52a. sometimes

52b. never

52c. sometimes

52d. always

53a.

x	y	1st diff	2nd diff
−2	18		
−1	3	−15	
0	−2	−5	10
1	3	5	10
2	18	15	10

Second differences of quadratic functions are constant.

53b.

x	y	1st diff	2nd diff
−2	28		
−1	7	−21	
0	0	−7	14
1	7	7	14
2	28	21	14

Second differences of quadratic functions are constant.

53c.

x	y	1st diff	2nd diff
−2	29		
−1	8	−21	
0	1	−7	14
1	8	7	14
2	29	21	14

Second differences of quadratic functions are constant.

53d.

x	y	1st diff	2nd diff
−2	23		
−1	5	−18	
0	1	−4	14
1	11	10	14
2	35	24	14

Second differences of quadratic functions are constant.

53e.

x	y	1st diff.	2nd diff.
−3	14	8	2
−2	6	**6**	2
−1	**0**	4	2
0	−4	2	2
1	**−6**	0	2
2	−6	**−2**	
3	**−4**		

53f.
$2 - 1 = 1$
$4 - 2 = 2$
$8 - 4 = 4$
$16 - 8 = 8$
$32 - 16 = 16$
$64 - 32 = 32...$

54.

x	y	1st diff.	2nd diff.
−3	14	8	2
−2	6	**6**	2
−1	**0**	4	2
0	−4	2	2
1	**−6**	0	2
2	−6	**−2**	
3	**−4**		

55a. $64 - 32 = 32...$

55b. $64 - 32 = 32...$

55c. $64 - 32 = 32...$

55d. A
A cubic polymonial has a degree of 3 the answer is A.

56. F

$$-3 \pm 5i = \frac{-b \pm \sqrt{(b)^2 - 4ac}}{2a}$$

$a = 1$ for all answer choices

$$-3 \pm 5i = \frac{-b \pm \sqrt{(b)^2 - 4(1)c}}{2(1)}$$

$$-3 \pm 5i = \frac{-b}{2} \pm \frac{\sqrt{(b)^2 - 4c}}{2}$$

$$-3 = \frac{-b}{2}$$

$b = 6$

$$5i = \frac{\sqrt{(6)^2 - 4c}}{2}$$

$$10i = \sqrt{36 - 4c}$$

$$\sqrt{-100} = \sqrt{36 - 4c}$$

$$-100 = 36 - 4c$$

$$4c = 136$$

$$c = 34$$

$$0 = x^2 + 6x + 34$$

$$x^2 + 6x = -34$$

the answer is F.

57. A

58. F

59. C

60. $-2x^3$
The degree is 3 and there is 1 term, so this is a cubic monomial.

61. $(3.7,\ -4.4),\ (-2.7,\ 8.4)$

62. $(-20,\ 360)$

63. $(-3,\ 0),\ (-1,\ -8)$

64. $35x - 5y = -2$

65. $6x + 2y = -5$

66. $2x + 7y = 28$

67. $12x - 10y = 5$

68. $(x + 3)(x + 4)$

69. $(x + 10)(x - 2)$

70. $(x - 12)(x - 2)$

Algebra 2
Lesson 5-2 - Practice and Problem-Solving Exercises Answers

7. $x(x+5)(x+2)$

8. $x(x-9)(x+2)$

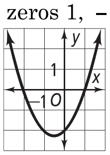
9. $x(x-7)(x+3)$

10. $x(x-6)(x+6)$

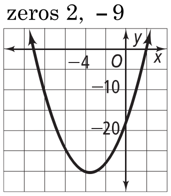
11. $x(x+4)^2$

12. $3x(3x-1)(x+1)$

13. zeros $1,\ -2$

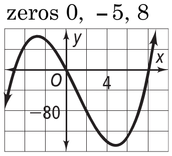


14. zeros $2,\ -9$

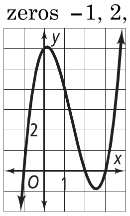


15.

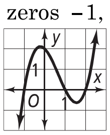
zeros $0,\ -5,\ 8$



16. zeros $-1,\ 2,\ 3$

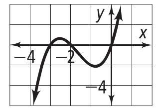


17. zeros $-1,\ 1,\ 2$



18.

zeros $0,\ -2,\ -3$



19. $x^3-18x^2+107x-210$

20. x^3+x^2-2x

21. $x^3+9x^2+15x-25$

22. $x^3-9x^2+27x-27$

23. x^3+2x^2-x-2

24. $x^3-\frac{7}{2}x^2-2x$

25. $x^4-5x^3+6x^2$

26. $x^4+10x^3+35x^2+50x+24$

27. zero -3 (multiplicity 3)

28. zeros 0 and 1 (multiplicity 3)

29. zeros $0,\ \frac{1}{2}$, and -1

30. zeros $0,\ -1,\ 1$

31. zero 4 (multiplicity 2)

32. zeros 1 and 2 (multiplicity 2)

33. zeros $-\frac{3}{2}$ and 1 (multiplicity 2)

34. zeros -1 (multiplicity 2), 1, and 2

35. relative max: $(-3.19,\ 24.19)$; relative min: $(0.52,\ -1.38)$

36. relative max: $(7.10,\ 5.05)$; relative min: $(3.57,\ -16.9)$

37. relative max: $(2.15,\ 12.32)$; relative min: $(-0.15,\ -12.32)$

38. relative max: $(0.57,\ 16.9)$; relative min: $(4.10,\ -5.05)$

39a. $h = x,\ \ell = 16 - 2x,\ w = 12 - 2x$

39b. $V = x(16 - 2x)(12 - 2x)$

39c.

The maximum volume is 194 in.^{3}, and the side of the cut-out squares is 2.26 in.

40. $3x(x-8)(x-1)$

41. $-2x(x+5)(x-4)$

42. $x^2(x+4)(x-1)$

43. $V = 5 \times 4 \times 3 = 60$
$2V = (x+5)(x+4)(x+3) = 120$
$x^3 + 12x^2 + 47x + 60 = 120$
$x^3 + 12x^2 + 47x - 60 = 0$
$(1)^3 + 12(1)^2 + 47(1) - 60 = 0$
$x = 1$
1 ft increase in each dimension

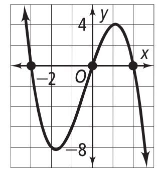
44a. volume of original block $= (2x+1)(x+4)(x+3)$
volume of wood removed $= (2x+1)(x+1)(x+2)$

44b. $V = 8x^2 + 24x + 10$

45. $V = 12x^3 - 27x$

46a. $x(2-x)(x+3)$

46b.



x-intercepts -3, 0, 2 represent where the volume is zero.

46c. $0 < x < 2$

46d. maximum: about 4.06 ft^3

47. relative maximum occurs at about $(2.53, 10.51)$: 10.51
relative minimum occurs at about $(5.14,\ -7.14)$: -7.14
zeros: $\frac{3}{2}$, 4, 6

48. relative maximum occurs at about $(-0.05,\ -2.98)$: -2.98
relative minimum occurs at about $(0.88,\ -6.17)$: -6.17
zero: 1.5

49. relative maximum: none
relative minimum occurs at $(-1,\ -1)$: -1
zeros: -2, 0

50. Answers may vary. Sample:
$y = x^4 - x^2$, in factored form $y = x^2(x+1)(x-1)$,
and zeros are 0, ± 1, multiplicity for 0 is 2.

51. Answers may vary. Sample:
The linear factors can be determined by examining the x-intercepts of the graph.

52. zeros: 0, 6, -6
multiplicity for 0 is 1, multiplicity for 6 is 1, multiplicity for -6 is 1

53. zeros: -1, 4, $\frac{3}{2}$
multipicity for -1 is 1, multiplicity for 4 is 1, multiplicity for $\frac{3}{2}$ is 1

54. zeros: -7, $-\frac{2}{5}$, 6
multiplicity for -7 is 1, multiplicity for $-\frac{2}{5}$ is 1, multiplicity for 6 is 2

55. $x^4 - 1$

56a. Answers may vary. Sample:
translation to the right 4 units

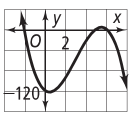
56b. No; the second graph is not the result of a horizontal translation.

56c. Answers may vary. Sample:
rotation of 180° about the origin

57. B
The answer is B.

58. G

59. B

60. 

Use a graphing calculator to find the relative maximum at $(5.52,\ 3.75)$ and relative minimum at $(0.48,\ -123.75)$.

61. $x^2 - 1 - 3x^5 + 2x^2 = -3x^5 + 3x^2 - 1$
quintic trinomial

62. $-2x^3 - 7x^4 + x^3 = -7x^4 - x^3$
quartic binomial

63. $6x + x^3 - 6x - 2 = x^3 - 2$
cubic binomial

64. $(x+4)(x+1)$

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

66. $(x-6)(x-6)$, or $(x-6)^2$

67. $-3,\ 2$

68. $\frac{1}{2},\ 3$

69. $\pm\frac{5}{2}$

Algebra 2
Lesson 5-3 - Practice and Problem-Solving Exercises Answers

10. $-4,\ 2 \pm 2i\sqrt{3}$

11. $10,\ -5 \pm 5i\sqrt{3}$

12. $\frac{3}{5},\ \frac{-3 \pm 3i\sqrt{3}}{10}$

13. $\frac{1}{4},\ \frac{-1 \pm i\sqrt{3}}{8}$

14. $-2,\ \pm i\sqrt{5}$

15. $\frac{1}{3},\ -\frac{5}{2}$

16. $3,\ \frac{-3 \pm 3i\sqrt{3}}{2}$

17. $4,\ -2 \pm 2i\sqrt{3}$

18. $\frac{1}{2},\ \frac{-1 \pm i\sqrt{3}}{4}$

19. $-\frac{1}{2},\ \frac{1 \pm i\sqrt{3}}{4}$

20. $\pm 1,\ \pm 3$

21. ± 2

22. $\pm 4,\ \pm 2i$

23. $\pm\sqrt{2},\ \pm 3i$

24. $\pm\sqrt{2},\ \pm i\sqrt{6}$

25. graph $y_1 = x^3 - 4x^2 - 7x$ and $y_2 = -10$
$-2,\ 1,\ 5$

26. graph $y_1 = 3x^3 - 6x^2 - 9x$ and $y_2 = 0$ (x-axis)
$-1,\ 0,\ 3$

27. graph $y_1 = 4x^3 - 8x^2 + 4x$ and $y_2 = 0$ (x-axis);
0, 1

28. graph $y_1 = x^2 - 8x$ and $y_2 = 0$ (x-axis)
0, 8

29. graph $y_1 = x^3 + 3x^2 + 2x$ and $y_2 = 0$ (x-axis)
$-2,\ -1,\ 0$

30. graph $y_1 = 2x^3 + 5x^2 - 7x$ and $y_2 = 0$ (x-axis)
$-3.5,\ 0,\ 1$

31. graph $y_1 = 4x^3 - 4x^2 - 3x$ and $y_2 = 0$ (x-axis)
$-0.5,\ 0,\ 1.5$

32. graph $y_1 = 2x^4 - 5x^3 - 3x^2$ and $y_2 = 0$ (x-axis)
$-0.5,\ 0,\ 3$

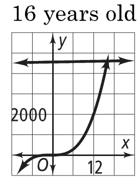
33. graph $y_1 = x^2 - 8x + 7$ and $y_2 = 0$ (x-axis)
1, 7

34. graph $y_1 = x^4 - 4x^3 - x^2 + 16x - 12$ and $y_2 = 0$ (x-axis)
$-2,\ 1,\ 2,\ 3$

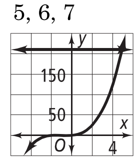
35. graph $y_1 = x^3 - x^2 - 16x - 20$ and $y_2 = 0$ (x-axis)
$-2,\ 5$

36. graph $y_1 = 3x^3 + 12x^2 - 3x - 12$ and $y_2 = 0$ (x-axis)
$-4,\ -1,\ 1$

37. 16 years old



38. 5, 6, 7



39. $0,\ 5 \pm 2\sqrt{3}$

40. $0,\ 3 \pm \sqrt{3}$

41. $0,\ \dfrac{5 \pm 5\sqrt{2}}{2}$

42. $-\dfrac{6}{5},\ \dfrac{3 + 3i\sqrt{3}}{6}$

43. $\dfrac{4}{3},\ \dfrac{-2 \pm 2i\sqrt{3}}{3}$

44. $\pm 2\sqrt{2},\ \pm 2i\sqrt{2}$

45. $1.9(1 \pm i),\ -1.9(1 \pm i)$

46. $\pm 3i,\ \pm i\sqrt{3}$

47. $0,\ \pm 1,\ \pm 2$

48. $0,\ \dfrac{1}{2} \pm \dfrac{\sqrt{265}}{10}$

49. $-1,\ \pm i$

50. ± 1

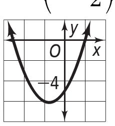
51. The dimensions of the box are 2 ft × 3ft × 6 ft.

52. A cubic function can have at most 3 zeros.

53. 5 m

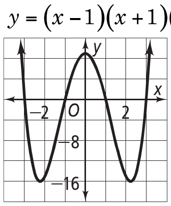
54. zeros $-\dfrac{5}{2},\ 1$

$y = \left(x + \dfrac{5}{2}\right)(x-1)$, or $y = (2x+5)(x-1)$



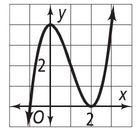
55. zeros $\pm 3,\ \pm 1$

$y = (x-1)(x+1)(x-3)(x+3)$



56. zeros $-1,\ 2$

$y = (x+1)(x-2)^2$



57. Check students' work.

58. The geometric figure consists of either 2 cubes or 3 rectangular blocks, each with total volume equal.

$V_{\text{large cube}} = a(a)\left[(a-b)+b\right] = a^3$

$V_{\text{small cube}} = b(b)\left[(a+b)-a\right] = b^3$

$V_{\text{total 2 cubes}} = V_{\text{large cube}} + V_{\text{small cube}} = a^3 + b^3$

$V_{\text{top rectangular block}} = a(a)(a-b) = a^2(a-b)$

$V_{\text{small bottom rectangular block}} = a(b)(a-b) = ab(a-b)$

$V_{\text{long bottom rectangular block}} = b(b)(a+b) = b^2(a+b)$

$$\begin{aligned} V_{\text{total 3 rectangluar blocks}} &= a^2(a-b) + ab(a-b) + b^2(a+b) \\ &= a(a-b)(a+b) + b^2(a+b) \\ &= (a+b)\left[a(a-b) + b^2\right] \\ &= (a+b)(a^2 - ab + b^2) \end{aligned}$$

so, $V_{\text{total 2 cubes}} = V_{\text{total 3 rectangular blocks}}$

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$.

59. Answers may vary. Sample:

$f(x) = 4x(x+12)\left(x - \dfrac{1}{4}\right)\left(x - \dfrac{1}{6}\right)$

$p(x) = x(x+12)(4x-1)(6x-1)$

60. $\dfrac{-1 \pm i\sqrt{3}}{2}$

61. C

62. I

63. B

64. Sam has five quarters and 7 dimes.

65. $3(x-4)(x-2)$

66. $2x(x+3)^2(x-3)$

67. $x^2(x-5)(x+1)$

68. $(x+2)(x-6)=0$

$-2,\ 6$

Check:

$(-2)^2-4(-2)\stackrel{?}{=}12 \qquad (6)^2-4(6)\stackrel{?}{=}12$

$4+8\stackrel{?}{=}12 \qquad 36-24\stackrel{?}{=}12$

$12=12 \qquad 12=12$

69. $(x+6)(x-6)=0$

$6,\ -6$

Check:

$(6)^2+1\stackrel{?}{=}37 \qquad (-6)^2+1\stackrel{?}{=}37$

$36+1\stackrel{?}{=}37 \qquad 36+1\stackrel{?}{=}37$

$37=37 \qquad 37=37$

70. $(2x+1)(x-3)=0$

$-\frac{1}{2},\ 3$

Check:

$2\left(-\frac{1}{2}\right)^2-5\left(-\frac{1}{2}\right)-3\stackrel{?}{=}0 \qquad 2(3)^2-5(3)-3\stackrel{?}{=}0$

$\frac{1}{2}+\frac{5}{2}-3\stackrel{?}{=}0 \qquad 18-15-3\stackrel{?}{=}0$

$0=0 \qquad 0=0$

71. 12

72. $-\frac{1}{5}$

Algebra 2
Lesson 5-4 - Practice and Problem-Solving Exercises Answers

9. quotient: $x-8$

10. quotient: $3x-5$

11. quotient: x^2+4x+3, R 5

12. quotient: $2x^2+5x+2$

13. quotient: $3x^2+3x+2$

14. quotient: $9x-12$, R -32

15. quotient: $x-10$, R 40

16. quotient: x^2+4x+3

17. $-4 \neq 0$; no

18. 0; yes

19. 0; yes

20. $60 \neq 0$; no

21. quotient: x^2+4x+3

22. quotient: x^2-2x+2

23. quotient: $x^2-11x+37$, R -128

24. quotient: x^2+2x+5

25. quotient: $x+1$, R 4

26. quotient: $3x^2+8x-3$

27. quotient: x^2-3x+9

28. quotient: $6x-2$, R -4

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

30. $(x+3)(x-4)(x-3)$

31. width = x; length = $x+3$; height = $x-2$

32. $P(-2)=18$

33. $P(-2)=0$

34. $P(3)=0$

35. $P(-2)=12$

36. $P(3)=168$

37. $P\left(\frac{1}{2}\right)=10$

38. $P(3)=51$

39. $P(-3)=0$

40. Since there is no remainder, the constant must be divisible by 4.
let $c =$ the value of the constant

$$x^2 - 7x + 4$$
$$x+4\overline{)x^3-3x^2-24x+c}$$
$$x^3+4x^2$$
$$-7x^2-24x$$
$$-7x^2-28x$$
$$4x+c$$
$$4x+16$$

$c-16=0$
$c=16$
x^2-7x+4; $x^3-3x^2-24x+16$

41. The constant term of the dividend is missing, and the divisor is -1 *not* 1.
$x^3-x^2-2x=(x+1)(x^2-2x)=(x+1)x(x-2)$

42. $5x^3-22x^2-3x-53$

43. $x+2$

44. quotient: x^2+4x+5

45. quotient: $x^3 - 3x^2 + 12x - 35$, R 109

46. quotient: $x^4 - x^3 + x^2 - x + 1$

47. quotient: $x + 4$

48. quotient: $x^3 - x^2 + 1$

49. no

50. yes

51. yes

52. no

53. yes

54. yes

55. no

56. no

57. quotient: $x^3 - x^2 + 1$

58. quotient: $x^3 + 2x^2 + x + 3$

59. quotient: $x^3 + 7x + 5$

60. quotient: $x^3 - 2x^2 - 2x + 4$, R -35

61. quotient: $x^3 - 2x^2 - x + 6$

62. quotient: $x^3 - 4x^2 + x$

63a. quotient: $x + 1$

63b. quotient: $x^2 + x + 1$

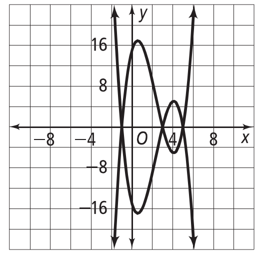
63c. quotient: $x^3 + x^2 + x + 1$

63d. $(x-1)(x^4 + x^3 + x^2 + x + 1)$

64. $a = 1$

65. quotient: $x + 2i$

66. $y = x^3 - 7x^2 + 7x + 15$



$y = -x^3 + 7x^2 - 7x - 15$

either $f(1) \times f(4)$ is positive $\times$ negative or negative $\times$ positive negative

67. D

68. I

69. A

70. $A = 78.5 \text{ cm}^2$
$r = 5 \text{ cm}$

71. $0, -1$

72. The real solutions are 0 and 1.

73. $-5, 0, 5$

74. $\dfrac{-3 \pm \sqrt{17}}{2}$

75. $-1 \pm \sqrt{3}$

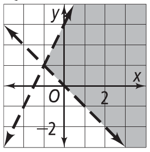
76. $1, -\dfrac{5}{7}$

77. $\dfrac{5 \pm \sqrt{5}}{2}$

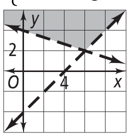
78. $3 \pm \sqrt{2}$

79. $\dfrac{-7 \pm \sqrt{5}}{2}$

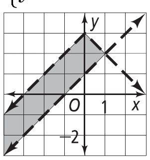
80. $\begin{cases} y < 2x + 3 \\ y > -x \end{cases}$



81. $\begin{cases} y > x - 4 \\ y > 4 - \dfrac{1}{3}x \end{cases}$



82. $\begin{cases} y < -|x| + 3 \\ y > x + 1 \end{cases}$



83. 24

84. 5

85. $23 - 11i$

Algebra 2
Lesson 5-5 - Practice and Problem-Solving Exercises Answers

9. no rational roots

10. no rational roots

11. no rational roots

12. no rational roots

13. no rational roots

14. no rational roots

15. no rational roots

16. $-1,\ \frac{1}{4},\ \frac{1}{2}$

17. no rational roots

18. $2i,\ -\sqrt{10}$

19. $14+\sqrt{2},\ 6i$

20. $-i,\ 7-8i$

21. $\sqrt{3},\ 5+\sqrt{11}$

22. $P(x)=x^2-19x+84$

23. $P(x)=x^2+24x+135$

24. $P(x)=x^2+100$

25. $P(x)=x^2-18x+90$

26. $P(x)=x^4-22x^3+466x^2-7368x-23168$

27. $P(x)=x^4-10x^3+294x^2-1690x+21125$

28. $P(x)=x^4-38x^3+710x^2-7126x+29125$

29. $P(x)=x^4-58x^3+1290x^2-13066x+51545$

30. no positive real roots; 2 or 0 negative real roots

31. 2 or 0 positive real roots; 1 negative real root

32. 2 or 0 positive real roots; 1 negative real root

33. $P(x)\neq 0,$ so there are no rational roots.

34. The rational roots of $P(x)=6x^4-13x^3+13x^2-39x-15$ are $\frac{5}{2}$ and $-\frac{1}{3}$.

35. $P(x)\neq 0,$ so there are no rational roots.

36. $P(x)\neq 0,$ so there are no rational roots.

37. $P(x)\neq 0,$ so there are no rational roots.

38. The rational roots of $P(x)=2x^3-3x^2-8x+12$ are $2,\ -2,$ and $\frac{3}{2}$.

39. $P(x)=x^4+3x^3+207x^2+675x-4050$

40. $P(x)=x^4-8x^3+75x^2-512x+704$

41. $P(x)=x^4+6x^3+27x^2-366x-518$

42. $h\approx 5.67$ cm

43. Error in second line, sign of second term; the line should be: $P(-1)=-x^3+x^2-x+1.$ Since there are three sign changes in $P(-x)$, there are three or one negative real roots.

44. For a polynomial with real coefficients, imaginary roots come in pairs; the imaginary root's conjugate is also a root.

45. trapezoid dimensions: 5 ft high, bases of 10 ft and 14 ft

46. Answers may vary. Sample:
$x^4 - x^2 - 2 = 0$
roots are $\pm\sqrt{2}$ and $\pm i$

47a. Answers may vary. Sample:
$x - \left(1 + \sqrt{2}\right) = 0$, or $x - 1 - \sqrt{2} = 0$

47b. Answers may vary. Sample:
$\left(x - \left(1 + \sqrt{2}\right)\right)^2 = 0$, or $x^2 - 2\left(1 + \sqrt{2}\right)x + \left(1 + \sqrt{2}\right)^2 = 0$

47c. Answers may vary. Sample:
$\left(x - \left(1 + \sqrt{2}\right)\right)\left(x - \left(1 - \sqrt{2}\right)\right) = 0,$
or $x^2 - x\left(1 + \sqrt{2}\right) - x\left(1 - \sqrt{2}\right) + \left(1 + \sqrt{2}\right)\left(1 - \sqrt{2}\right) = 0,$
or $x^2 - x - x\sqrt{2} - x + \sqrt{2}x + 1 - 2 = 0,$
or $x^2 - 2x - 1 = 0$
$x^2 - 2x + c = 0$, so $c = -1$

48a. 2 real, 2 imaginary
4 imaginary
4 real

48b. 5 real
3 real, 2 imaginary
4 imaginary, 1 real

48c. Answers may vary. Sample:
It has an odd number of real solutions, but it must have at least one real solution.

49. Answers may vary. Sample:
You cannot use the Conjugate Root Theorem for irrational roots unless the equation has rational coefficients.

50. 2

51. −4

52. Since each factor has a conjugate pair, there are at least 4 factors; the minimum degree must therefore be 4.

53. $y = \frac{1}{6}$

54. 2.5

55. $x^2 + 6x + 6$, R 3

56. $8x^2 - 36x + 216$, R -1289

57. $7x - 3$, R 2

58. $\pm 3i$

59. $\pm 9i$

60. $\pm 12i$

61. quartic polynomial of four terms

62. quintic polynomial of four terms

Algebra 2
Lesson 5-6 - Practice and Problem-Solving Exercises Answers

8. $3, \pm i$

9. $-1, \pm 2i$

10. $-3, -2, 1$

11. $-1, 2, 4$

12. $-3, -1, \pm 2i$

13. $2, \pm\sqrt{3}$

14. $0, \pm 1, \pm 2i$

15. $0, \pm 3, \pm i$

16. zeros are $\frac{1 \pm i\sqrt{7}}{4}$

17. zeros are $3, \pm i$

18. zeros are $4, \frac{1 \pm i\sqrt{3}}{2}$

19. zeros are $2, \pm\sqrt{3}$

20. zeros are $\pm\sqrt{2}, \pm 2$

21. zeros are $\pm 2, \pm i$

22. zeros are $0, \frac{3 \pm 3\sqrt{5}}{2}$

23. zeros are $-6, \pm i$

24. zeros are $\pm 2, \frac{-3 \pm i\sqrt{11}}{2}$

25. zeros are $\pm 4, \frac{-1 \pm i\sqrt{3}}{2}$

26. 4 complex roots
0, 2, or 4 real roots
possible rational roots: $\pm\frac{1}{2}, \pm 1, \pm 2, \pm\frac{13}{2}, \pm 13, \pm 26$

27. 5 complex roots
1, 3, or 5 real roots
possible rational roots: $\pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18$

28. 3 complex roots
1 or 3 real roots, possible rational roots:
$\pm\frac{1}{3}, \pm\frac{2}{3}, \pm 1, \pm\frac{4}{3}, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

29. 6 complex roots
0, 2, 4, or 6 real roots, possible rational roots:
$\pm\frac{1}{4}, \pm\frac{1}{2}\ \pm\frac{3}{4}, \pm 1, \pm\frac{3}{2}, \pm 2, \pm 3, \pm 4, \pm 6, \pm 8, \pm 12, \pm 24$

30. zeros are $4, \pm 3i$

31. zeros are $-2, \pm\sqrt{5}$

32. zeros are $-2, -\frac{1}{2}, 4$

33. zeros are $-2, \frac{4}{3}, 3$

34. zeros are $-2, 3 \pm i\sqrt{2}$

35. zeros are $3, -1 \pm i\sqrt{2}$

36. zeros are $-2, 3, \pm i$

37. zeros are $-1, -\frac{1}{2}, \pm 3$

38. $f(x) = x^4 - 5x^3 - 28x^2 + 188x - 240$

5 |	1	–5	–28	188	–240
		5	0	–140	240
	1	0	–28	48	0

$f(x) = (x - 5)(x^3 - 28x + 48)$

Use the Rational Root Theorem to find a root of the cubic factor. Possible roots are ±1, ±2, ±3, ±4, ±6, ±8, ±12, ±16, $\pm\frac{1}{2}$, $\pm\frac{1}{3}$, $\pm\frac{1}{4}$, $\pm\frac{1}{6}$, $\pm\frac{1}{8}$, $\pm\frac{1}{12}$, $\pm\frac{1}{16}$. Synthetic division shows that 2 is another root.

2 |	1	0	–28	48
		2	4	–48
	1	2	–24	0

$f(x) = (x - 5)(x - 2)(x^2 + 2x - 24)$
$= (x - 5)(x - 2)(x + 6)(x - 4)$

The loading zone can be at any of the zeros: –6, 2, 4, or 5.

39. 3 bridges

40. Maurice is incorrect; Every function of degree 1 has exactly one zero, but $y = 2$ is a function of degree 0. Therefore, $y = 2$ has no zero or x-intercept.

41. sometimes

42. never

43. always

44. No; a 4th degree polynomial has 4 roots. If $5 - i$ is a root, then by the Conjugate Root Thm. $5 + i$ must also be a root. Likewise, if $4 + i$ is a root, then $4 - i$ must also be a root. This would result in 5 roots, which is impossible.

45. Answers may vary. Sample:
$y = x^4 + 3x^2 + 2$

46. C

47. Given any polynomial equation of odd degree $n \geq 1$, the equation has exactly n roots. Since imaginary roots occur in pairs, a polynomial of odd degree n will have an even number of imaginary roots and thus an odd number of real roots. So, any odd degree polynomial equation with real coefficients has at least one real root.

48. 5; Because a quintic polynomial has degree 5 and therefore has 5 zeros, it can also have 5 points of intersection with a quartic polynomial.

49. 5th degree;

$(x - \sqrt{2})(x + \sqrt{2})(x - \sqrt{3})(x + \sqrt{3})(x - a)$

$(x^2 - 2)(x^2 - 3)(x - a)$

$(x^4 - 5x^2 + 6)(x - a)$

$6(-a) = 5$

$a = -\frac{5}{6}$

$(x^4 - 5x^2 + 6)\left(x + \frac{5}{6}\right)$

$x^5 + \frac{5}{6}x^4 - 5x^3 - \frac{25}{6}x^2 + 6x + 5$

rational zero $-\frac{5}{6}$

50. B

51. G

52. D

53. Substitute (2, –2) into both inequalities to see if the point satisfies both inequalities. If it does, then (2, –2) is a solution of the system. If one or both inequalities are not satisfied by the point (2, –2), then (2, –2) is not a solution of the system.

54. Roots $2i,\ -2i,\ -3 + i,\ -3 - i$

$0 = (x - 2i)(x + 2i)(x - (-3 + i))(x - (-3 - i))$

$0 = (x^2 - 4i^2)[x^2 - x(-3 + i) - x(-3 - i) + (-3 + i)(-3 - i)]$

$0 = (x^2 + 4)(x^2 + 3x - xi + 3x\ + xi + 9 - i^2) = (x^2 + 4)(x^2 + 6x + 10)$

$0 = x^4 + 6x^3 + 10x^2 + 4x^2 + 24x + 40$

$0 = x^4 + 6x^3 + 14x^2 + 24x\ + 40$

55. $\frac{6 \pm 4\sqrt{2}}{2} = 3 \pm 2\sqrt{2}$

56. $\frac{-5 \pm i\sqrt{47}}{4}$

57. $\frac{3 \pm i\sqrt{23}}{4}$

58. Use $(-1, 0)$: $a \cdot (-1)^2 + b \cdot (-1) + c = 0$, or $a - b + c = 0$

use $(2, 3)$: $a \cdot 2^2 + b \cdot 2 + c = 3$, or $4a + 2b + c = 3$

use $(1, 4)$: $a \cdot 1^2 + b \cdot 1 + c = 4$, or $a + b + c = 4$

use matrix = $\begin{bmatrix} 1 & -1 & 1 & 0 \\ 4 & 2 & 1 & 3 \\ 1 & 1 & 1 & 4 \end{bmatrix}$

rref = $\begin{bmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{bmatrix}$

$(a,\ b,\ c) = (-1, 2, 3)$ in $y = ax^2 + bx + c$: $f(x) = -x^2 + 2x + 3$

59. Use $(-4, 11)$: $a \cdot (-4)^2 + b \cdot (-4) + c = 11$, or $16a - 4b + c = 11$

use $(-5, 5)$: $a \cdot (-5)^2 + b \cdot (-5) + c = 5$, or $25a - 5b + c = 5$

use $(-6, 3)$: $a \cdot (-6)^2 + b \cdot (-6) + c = 3$, or $36a - 6b + c = 3$

use matrix = $\begin{bmatrix} 16 & -4 & 1 & 11 \\ 25 & -5 & 1 & 5 \\ 36 & -6 & 1 & 3 \end{bmatrix}$

rref = $\begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 24 \\ 0 & 0 & 1 & 75 \end{bmatrix}$

$(a,\ b,\ c) = (2, 24, 75)$ in $y = ax^2 + bx + c$: $f(x) = 2x^2 + 24x + 75$

60. $x^3 + 3x^2 + 3x + 1$

61. $x^3 - 9x^2 + 27x - 27$

62. $x^4 - 8x^3 + 24x^2 - 32x + 16$

63. $x^2 - 2x + 1$

64. $x^3 + 15x^2 + 75x + 125$

65. $-x^3 + 12x^2 + 48x + 64$

Algebra 2
Lesson 5-7 - Practice and Problem-Solving Exercises Answers

8. The coefficients from the third row of Pascal's Triangle are 1, 3, 3, 1
$1x^3(-y)^0 + 3x^{3-1}(-y)^1 + 3x^{3-2}(-y)^2 + 1x^{3-3}(-y)^3$
$= x^3 - 3x^2y + 3xy^2 - y^3$

9. $a^4 + 8a^3 + 24a^2 + 32a + 16$

10. $46,656 + 46,656a + 19,440a^2 + 4320a^3 + 540a^4 + 36a^5 + a^6$

11. $x^3 - 15x^2 + 75x - 125$

12. $y^8 + 8y^7 + 28y^6 + 56y^5 + 70y^4 + 56y^3 + 28y^2 + 8y + 1$

13. $x^{10} + 20x^9 + 180x^8 + 960x^7 + 3360x^6 + 8064x^5 + 13,440x^4 +$
$15,360x^3 + 11,520x^2 + 5120x + 1024$

14. $b^7 - 28b^6 + 336b^5 - 2240b^4 + 8960b^3 - 21,504b^2 + 28,672b -$
$16,384$

15. $b^9 + 27b^8 + 324b^7 + 2268b^6 + 10,206b^5 + 30,618b^4 + 61,236b^3 +$
$78,732b^2 + 59,049b + 19,683$

16. $128x^7 - 448x^6y + 672x^5y^2 - 560x^4y^3 + 280x^3y^4 - 84x^2y^5 +$
$14xy^6 - y^7$

17. $a^4 + 12a^3b + 54a^2b^2 + 108ab^3 + 81b^4$

18. $4096x^6 + 12,288x^5 + 15,360x^4 + 10,240x^3 + 3840x^2 + 768x + 64$

19. $x^8 - 32x^7 + 448x^6 - 3584x^5 + 17,920x^4 - 57,344x^3 +$
$114,688x^2 - 131,072x + 65,536$

20. $16x^2 + 40x + 25$

21. $27a^3 - 189a^2 + 441a - 343$

22. $64a^6 + 3072a^5 + 61,440a^4 + 655,360a^3 + 3,932,160a^2 +$
$12,582,912a + 16,777,216$

23. $81y^4 - 1188y^3 + 6534y^2 - 15,972y + 14,641$

24. $x^6 - \frac{3}{2}x^4 + \frac{3}{4}x^2 - \frac{1}{8}$

25a. Each term of $(2m - 3n)^9$ has exponents that add to 9.
In the term with m^3 the exponent of n is $9 - 3 = 6$.

25b. Pascal's Triangle identifies this term $(2m - 3n)^9$ as $84m^3n^6$.
$84(2m)^3(-3n)^6 = 84(8)(729)m^3n^6 = 489,888m^3n^6$,
so the coefficient is 489,888

26. The fourth term of $(x + 2)^5$ is $10(x)^2(2)^3 = 80x^2$.

27. The third term of $(x - 3)^6$ is $15(x)^4(-3)^2 = 135x^4$.

28. The third term of $(3x - 1)^5$ is $10(3x)^3(-1)^2 = 270x^3$.

29. The fifth term of $(a + 5b^2)^4$ is $(5b^2)^4 = 625b^8$.

30. The coefficient of 2 in $2y$ will affect the terms.

31. The challenge of the Binomial Theorem is when there is a coefficient before the *x*. However, it is much more efficient to use the Binomial Theorem than FOIL when expanding a binomial that is raised to a high power.

32. $64x^6 - 384x^5y + 960x^4y^2 - 1280x^3y^3 + 960x^2y^4 - 384xy^5 + 64y^6$

33. $x^{20} + 40x^{18} + 720x^{16} + 7680x^{14} + 53,760x^{12} + 258,048x^{10} +$
$860,160x^8 + 1,966,080x^6 + 2,949,120x^4 + 2,621,440x^2 + 1,048,576$

34. $x^6 - 3x^4y^2 + 3x^2y^4 - y^6$

35. $a^5 - 5a^4b^2 + 10a^3b^4 - 10a^2b^6 + 5ab^8 - b^{10}$

36. $27x^3 + 216x^2y + 576xy^2 + 512y^3$

37. $256x^4 - 1792x^3y + 4704x^2y^2 - 5488xy^3 + 2401y^4$

38. $282,475,249a^{10} + 807,072,140a^9y + 1,037,664,180a^8y^2 +$
$790,601,280a^7y^3 + 395,300,640a^6y^4 + 135,531,648a^5y^5$
$+32,269,440a^4y^6 + 5,268,480a^3y^7 + 564,480a^2y^8 + 35,840ay^9 +$
$1024y^{10}$

39. $4096x^{18} + 12{,}288x^{15}y^2 + 15{,}360x^{12}y^4 + 10{,}240x^9y^6 + 3840x^6y^8 + 768x^3y^{10} + 64y^{12}$

40. $2187b^7 - 183{,}708b^6 + 6{,}613{,}488b^5 - 132{,}269{,}760b^4 + 1{,}587{,}237{,}120b^3 - 11{,}428{,}107{,}264b^2 + 45{,}712{,}429{,}056b - 78{,}364{,}164{,}096$

41. $125a^3 + 150a^2b + 60ab^2 + 8b^3$

42. $b^{16} - 16b^{14} + 112b^{12} - 448b^{10} + 1120b^8 - 1792b^6 + 1792b^4 - 1024b^2 + 256$

43. $-32y^{10} + 80y^8x - 80y^6x^2 + 40y^4x^3 - 10y^2x^4 + x^5$

44. Area: $4x^2 + 32x + 64$
Volume: $8x^3 + 96x^2 + 384x + 512$

45. Answers may vary. Sample:
Since one of the terms has a minus sign (–*y*) and it is alternately raised to odd and even powers, the coefficient is negative when raised to an odd power and positive when raised to an even power.

46. The student did not raise 3 to the appropriate power.
The correct answer is:
$81x^4 - 864x^3 + 3456x^2 - 6144x + 4096$

47. $-29{,}113 + 17{,}684i$

48. $702 - 486i$

49. $\left(x^{14} - 21x^{10} + 35x^6 - 7x^2\right) + i\left(-7x^{12} + 35x^8 - 21x^4 + 1\right)$

50. $1024a^{10}$

$n = 10$ — We can use the tenth row in Pascal's Triangle to factor out the coefficient, which is 1.

$a = \sqrt[10]{1024}$ — Since the coefficient is 1, a is the tenth root of 1024.

$a = 2$

51. $\left(\frac{1}{2}x + \frac{1}{4}y\right)^8$

Because $n = 8$, x^7y must be the second term.
Using Pascal's Triangle we find the second term should be

$$8\left(\frac{1}{2}x\right)^7\left(\frac{1}{4}y\right) = 8\left(\frac{1}{512}\right)x^7y = \frac{1}{64}x^7y$$

The coefficient is $\frac{1}{64}$.

52a. -4

52b. -4

53. 8

54. C

55. G

56. B

57. 15.9 hours

58. $-1,\ -3,\ \frac{-3 \pm i\sqrt{11}}{2}$

59. $1,\ \pm i,\ \pm 3i$

60. $-4,\ \frac{-3 \pm i\sqrt{7}}{4}$

61. $1,\ \frac{-1 \pm 3i\sqrt{3}}{2}$

62. $-18 + 43i$

63. $600i$

64. -2

65. $\frac{7}{5} + \frac{31}{5}i$

66. $2x^3 + 5x^2 - x + 9$
cubic polynomial of 4 terms

67. $-7x^2 + 4x + 1$
quadratic trinomial

68. $12x^4 - 3x^3 - 9x^2 + x - 8$
quartic polynomial of 5 terms

Algebra 2
Lesson 5-8 - Practice and Problem-Solving Exercises Answers

8. $y = -9x + 5$

9. $y = \frac{1}{2}x - 3$

10. $y = -5x - 11$

11. $y = -0.9285714286x^2 + 7.78571428x + 4$

12. $y = -1.2x^2 + 6.6x + 2$

13. $y = x^2 - 6x + 1$

14. $y = -x^2 + 4x - 10$

15. $y = 2x^3 + x^2 - 4x + 6$

16. Answers may vary. Sample:
$x =$ years since 1900
linear: $49.23809x - 2614.28571$
quadratic: $0.371129x^2 - 13.740157x - 28.503937$
cubic: $0.027777x^3 - 6.71111x^2 + 578.19444x - 16226.667$
Although the cubic model fits the data best, the linear model is probably more accurate. Federal spending may vary according to revenues and the health of the economy.

17. Answers may vary. Sample:
$x =$ years since 1900
quadratic: $-0.000125x^2 - 0.00275x + 2.8035$
linear: $-0.245x + 3.734$
cubic: $-8.33 \times 10^{-6}x^3 + 0.00205x^2 - 0.1902666x + 8.1424$
Since population cannot grow indefinitely, the model with the slower rate of growth in the long term, the quadratic model, is better.

18. Answers may vary. Sample:
$x =$ years since 1900
linear: $5.8x - 379.666667$
quadratic: $0.8x^2 - 146.2x + 6827$
Not enough data is given to determine a cubic model. The quadratic model appears to fit the given data better, but since home prices can go up and down repeatedly, a linear model is probably more accurate over time.

19. Answers may vary. Sample:
linear: $-0.05725x + 19.93$
quadratic: $-0.025125x^2 + 0.14375x + 19.595$
Not enough data is given to determine a cubic model. Although neither model is likely to fit the data reliably over time since US oil production is subject to variation and vulnerable to natural disasters, the quadratic model appears to fit the given data better.

20. Answers may vary. Sample:
using the linear model, 1990: \$1863.69 billion; 2010: \$3439.57 billion

21. Answers may vary. Sample:
using the cubic model, $y = -8.33 \times 10^{-6}x^3 + 0.002x^2 - 0.190x + 8.142$;
1950: 2.6%; 1988: 1.23%; 2010: 0.35%

22. Answers may vary. Sample:
using the linear model, $y = 5.8x - 379.667$, 1985: ≈ \$113,300; 1999: ≈ \$194,500; 2020: ≈ \$316,300

23. Answers may vary. Sample:
using the quadratic model, $y = -0.025x^2 + 0.14x + 19.595$, January:19.714 million barrels/day; March: 19.8 million barrels/day; October: 18.535 million barrels/day

24. quartic because $R^2 = 1$

25. quartic because $R^2 = 1$

26. $n = 5$; Use the QuarticReg feature on your graphing calculator
$y = 0.00050834582x^4 - 0.002337246x^3 - 0.034875541x^2 + 0.293315083x - 1$

27. $n = 5$; Use the QuarticReg feature on your graphing calculator
$y = -0.275x^4 + 0.85x^3 - 4.025x^2 - 8.15x + 7$

28. quite confident because, although 2022 is outside the domain of the data, the data fit the graph very well based on the R^2 value of 1.

29. $y = 0.0611511911x^3 - 0.9276466231x^2 + 6.184642324x + 1.750778723$; $R^2 = 0.9994739763$; good fit

30. $y = -0.0288800705x^3 - 0.469356261x^2 - 7.401675485x + 3.038800705$; $R^2 = 1$; good fit

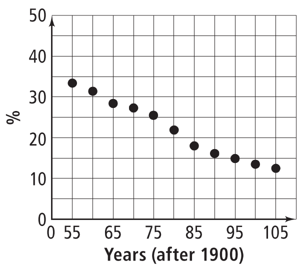
31. $n = 5$; Use the QuarticReg feature on your graphing calculator
Answers may vary. Sample:
$f(x) = 0.111x^4 - 1.916x^3 + 10.147x^2 - 15.825x + 77.2$

32. Method 1: Graph the scatter plot and determine which regression model best fits the data. Method 2: Enter the data in your calculator, and use the regression function with the correlation function closest to 1 as the model.

33. A quadratic model would be more appropriate given the real world context. According to the cubic model, there would be a negative number of students in the year 2024.

34. The cubic model fits the data closely ($R^2 = 0.99980$), but the quartic function fits the five points perfectly ($R^2 = 1$) in accordance with the $(n + 1)$ Point Principle. The quartic model is the best fit.

35a.



A cubic model seems to be most appropriate.

35b. The model is $y = 0.00022688423x^3 - 0.0525547786x^2 + 3.505260295x - 38.64568765$.

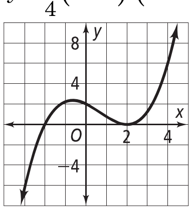
35c. $y = 0.00022688423(120)^3 - 0.0525547786(120)^2 + 3.505260295(120) - 38.64568765 = 17.3$

35d. Yes, $R^2 = 0.99289$

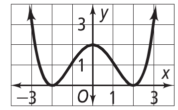
36a. $y = x^2 - 4x + 4$

36b. $y = (x-2)^2(x+2)$; the zeros are perfect, but the y-intercept (8) is too large.

36c. $y = \frac{1}{4}(x-2)^2(x+2)$



37. $y = \frac{1}{8}(x^2 - 4)^2$



38. The program will take 71.4 seconds to run with an input of 1000 files.

39. 1

40. The function has one zero with a multiplicity of 2.

41. $-\frac{7}{8}$

42. The degree is 5.

43. $32x^5 + 240x^4 + 720x^3 + 1080x^2 + 810x + 243$

44. $1331x^3 - 363x^2 + 33x - 1$

45. $4096 - 6144x + 3456x^2 - 864x^3 + 81x^4$

46. $64 + 432x + 972x^2 + 729x^3$

47. $|x - 8| < 1$

48. $\left|x - \frac{3}{8}\right| \le \frac{1}{8}$

49. $|y - 2.8| < 1.1$

50. $|t - 750| < 250$

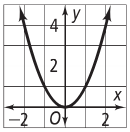
51. $A = s^2$
This is the formula for area of a square.
Side lengths cannot be negative, so the answer is $s = \sqrt{A}$

52. $\ell = \frac{P}{2} - w$

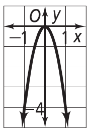
53. $r = \frac{C}{2\pi}$

54. $b = \frac{A}{h}$

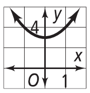
55. $y = x^2$



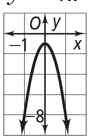
56. $y = -4x^2$



57. $y = x^2 + 3$



58. $y = -7x^2 - 1$



Algebra 2
Lesson 5-9 - Practice and Problem-Solving Exercises Answers

7. Vertically stretch $y = x^3$ by a factor of 3:
$y = 3x^3$
Reflect in the x-axis:
$y = (-1) \cdot 3x^3$
$y = -3x^3$
Translate up 2 units (k) and right 1 unit (h):
$y = -3(x-h)^3 + k$
$y = -3(x-1)^3 + 2$

8. $y = 2(x+3)^3 + 4$

9. $y = -(x+5)^3 - 1$

10. $y = (x-2)^3 - 3$

11. Vertically stretch $y = x^3$ by a factor of 3;
$y = -3\left(x + \frac{1}{2}\right)^3 + \frac{3}{4}$

12. Vertically stretch $y = x^3$ by a factor of $\frac{5}{3}$;
$y = -\frac{5}{3}(x-3)^3 - 4$

13. $x = \frac{8}{3}$

14. $x = 3$

15. $x = -\frac{2}{15}$

16. $x = -3 + \frac{1}{4}\sqrt[3]{36}$

17. $x = 1 - \frac{1}{2}\sqrt[3]{20}$

18. $x = -5 - \sqrt[3]{5}$

19. Answers may vary. Sample:
$y = (x-2)(x-(-1)) \cdot Q(x)$
$= (x-2)(x+1)(x^2+1)$
$= (x^2 + x - 2x - 2)(x^2+1)$
$= (x^4 + x^2) + (x^3 + x) + (-2x^3 - 2x) + (-2x^2 - 2)$
$= x^4 + (-2x^3 + x^3) + (x^2 - 2x^2) + (-2x + x) - 2$
$= x^4 - x^3 - x^2 - x - 2$

20. Answers may vary. Sample:
$y = (x-(-3))(x-(-4)) \cdot Q(x)$
$= (x+3)(x+4)(x^2+1)$
$= (x^2 + 4x + 3x + 12)(x^2+1)$
$= (x^4 + x^2) + (4x^3 + 4x) + (3x^3 + 3x) + (12x^2 + 12)$
$= x^4 + (4x^3 + 3x^3) + (x^2 + 12x^2) + (4x + 3x) + 12$
$= x^4 + 7x^3 + 13x^2 + 7x + 12$

21. Answers may vary. Sample:
$y = (x-(-1))(x-3) \cdot Q(x)$
$= (x+1)(x-3)(x^2+1)$
$= (x^2 - 3x + x - 3)(x^2+1)$
$= (x^4 + x^2) + (-3x^3 - 3x) + (x^3 + x) + (-3x^2 - 3)$
$= x^4 + (-3x^3 + x^3) + (x^2 - 3x^2) + (-3x + x) - 3$
$= x^4 - 2x^3 - 2x^2 - 2x - 3$

22. Answers may vary. Sample:
$y = (x-4)(x-2) \cdot Q(x)$
$= (x-4)(x-2)(x^2+1)$
$= (x^2 - 2x - 4x + 8)(x^2+1)$
$= (x^4 + x^2) + (-2x^3 - 2x) + (-4x^3 - 4x) + (8x^2 + 8)$
$= x^4 + (-2x^3 - 4x^3) + (x^2 + 8x^2) + (-2x - 4x) + 8$
$= x^4 - 6x^3 + 9x^2 - 6x + 8$

23. Answers may vary. Sample:
$y = (x-(-4))(x-(-1)) \cdot Q(x)$
$= (x+4)(x+1)(x^2+1)$
$= (x^2 + x + 4x + 4)(x^2+1)$
$= (x^4 + x^2) + (x^3 + x) + (4x^3 + 4x) + (4x^2 + 4)$
$= x^4 + (x^3 + 4x^3) + (x^2 + 4x^2) + (x + 4x) + 4$
$= x^4 + 5x^3 + 5x^2 + 5x + 4$

24. Answers may vary. Sample:
$$\begin{aligned} y &= (x-(-3))(x-2)\cdot Q(x) \\ &= (x+3)(x-2)(x^2+1) \\ &= (x^2-2x+3x-6)(x^2+1) \\ &= (x^4+x^2)+(-2x^3-2x)+(3x^3+3x)+(-6x^2-6) \\ &= x^4+(-2x^3+3x^3)+(x^2-6x^2)+(-2x+3x)-6 \\ &= x^4+x^3-5x^2+x-6 \end{aligned}$$

25. ≈ 38 slices

26. $\approx 17{,}155.9$ ft^3

27. In this function, 5 represents the weight of the ball. Substitute the velocity 6 for v.

28. Yes, $y = 3x^3$ is the vertical stretch of parent function $y = x^3$ by a factor of 3.
$y = x^3$
$y = 3\cdot x^3$
$y = 3x^3$

29. $y = 2(x-3)^2 + 5$

30. No, $y = x^3 - x$ cannot be obtained from $y = x^3$ using basic transformations.

31. Yes, find the vertex to obtain the translated units.
$y = x^2 - 8x + 7$ is the parent function $y = x^2$ translated 4 units right and 9 units down.

32. Yes, translate left 2 units (h) using parent function $y = x^4$:
$y = (x+2)^4$

33. Yes, using parent function $y = x^3$, vertically stretch by a factor of 4 and reflect in the x-axis:
Vertical stretch:
$y = 4x^3$
Reflect in the x-axis:
$y = -4x^3$

34. translation 4 units up and 1 unit to the left

35. reflection over the x-axis, vert. stretch by a factor of 2, translation 1 unit up and 1 unit to the right

36. reflection over the x-axis, translation 2 units down and 3 units to the right

37. vertical stretch by a factor of 3, translation 2 units down and 1 unit to the right

38. vertical stretch by a factor of 5, translation 1 unit up and 1 unit to the right

39. reflection over the x-axis, translation 2 units up and 4 units to the right

40. 40 lb$\cdot$ft^2/s^2

41. The parent function, $y = x^5$, has only one x-intercept.

42. Some quartic polynomials have four x-intercepts and cannot be written in the form $y = (x-h)^4 + k$.
Examples:
$y = (x-2)(x+2)(x-4)(x+4)$
$y = (x^2-4)(x^2-16)$
$y = x^4 - 20x^2 + 64$

$y = (x-1)(x+1)(x-2)(x+2)$
$y = (x^2-1)(x^2-4)$
$y = x^4 - 5x^2 + 4$

43. Error in (2) "a transformation of $y = x^2$." Not all cubic polynomials contain an x^2 term.

44. $y = 2(x-1)^3 + 7$
vertical stretch by a factor of 2, translation 7 units up and 1 unit to the right

45. 150 watts

46. Even degree parent functions and their offspring have 2 x-intercepts, odd degree parent functions and their offspring have 1 x-intercept. Polynomial functions of degree n have as many as n x-intercepts.
Example:
$y = x^3 - 2x^2 - 5x + 6$ (with 3 x-intercepts) cannot be generated from the parent function $y = x^3$ (with 1 x-intercept).

47. B

48. G

49. 4
Its discriminant is positive.

50. $y = -2x^3 + 3x^2 - x - 2$

51. $y = 3x^3 - 5x - 3$

52. $y = -\frac{4}{5}x + \frac{16}{5}$

53. $y = -3x + 5$

54. Yes, for each value of *x* there is only one *y* value.

55. No, there are two *y* values for each value of *x*.

56. $x^2\left(x^8+1\right)$

57. $(x - y)(x + y)\left(x^2 + y^2\right)$

58. $13x^3y^6\left(13x^3y^6 - 1\right)$