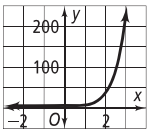
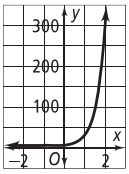
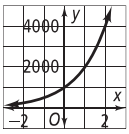
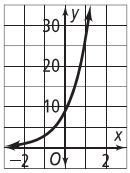
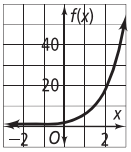
Algebra 2
Lesson 7-1 - Practice and Problem-Solving Exercises Answers

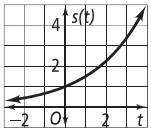
10. 

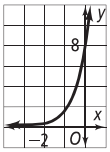
11. 

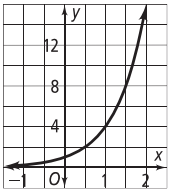
12. 

13. 

14. 

15. 

16. 

17. 

18. exponential growth; 129

19. exponential decay; 2

20. exponential growth; 12

21. exponential decay; 0.8

22. exponential decay; 4

23. exponential growth; 0.45

24. exponential growth; $\frac{1}{100}$

25. exponential decay; 1

26a. \$2249.73

26b. \$4051.63

26c. 6 years

26d. 11 years

27. $y = 120{,}000(1.012)^x$; 143,512.

28. $y = 1{,}860{,}000(0.985)^x$; 1,551,485

29a. $y = 72\left(\frac{1}{2}\right)^x$

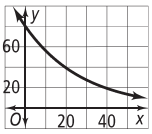
29b. 2.25 inches

30. \$262.48; yes; $A(t) = 1000(1.06)^t$; no; when $t = 4$, $A(t) = \$1262.48$ which represents the amount of money in the account after four years.

31a. about 5.6%

31b. about 0.0017%

32a. $y = 80(0.965)^x$

32b. 

The population first drops below 15 animals in about 47 years.

33. Answers may vary. Sample:
$y = 59.5(0.6)^x$

34. 1.70

35. 6

36. 0.25

37. 0.45

38. 1.125

39. 0.999

40. 1.001

41. 2

42. about $42,140

43. C

44. Check students' work.

45. B
The graph shows a decreasing function, which eliminates A.
The y-values are all positive, which eliminates C.
The answer is B.

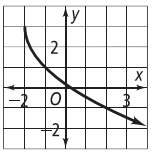
46. C

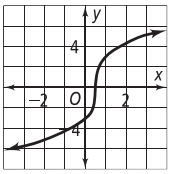
47. G

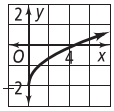
48. D

49. G

50. $r = \frac{11D^{-1} + 5}{10}$
$10r - 5 = 11D^{-1}$
$\frac{10r - 5}{11} = D^{-1}$
The inverse function tells you the speed the car is traveling when you see the deer, given the number of feet the car travels during your reaction time. Yes; the inverse is a function.

51. 

52. 

53. 

54. $(2 + 3x)(4 - 6x + 9x^2)$

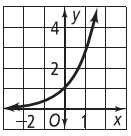
55. $(3x - 1)(x + 4)$

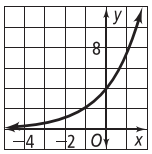
56. $(4x - 5)(4x - 5)$

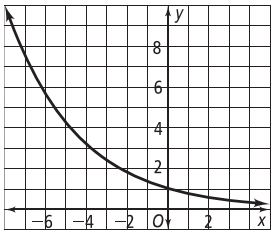
57. $(1, -1)$

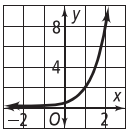
58. $(0, 0)$

59. $(3, -3, 9)$

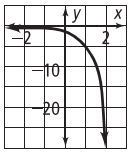
60. 

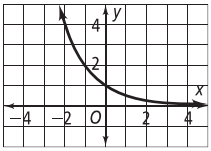
61. 

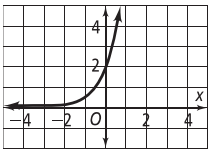
62. 

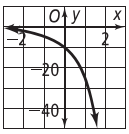
63. 

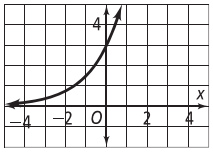
Algebra 2
Lesson 7-2 - Practice and Problem-Solving Exercises Answers

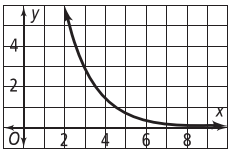
7. 

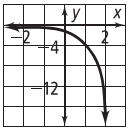
8. 

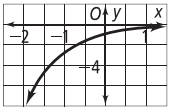
9. 

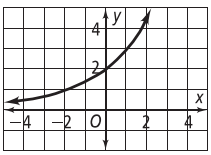
10. 

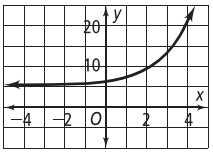
11. 

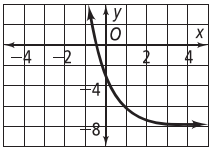
12. 

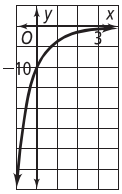
13. 

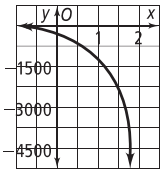
14. 

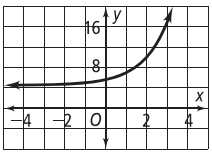
15. 

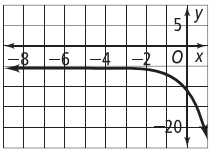
16. 

17. 

18. 

19. 

20. 

21. 

22a. $y = 127.27(0.837)^x + 70$

22b. about 5.25 minutes

23. 403.4288

24. 0.1353

25. 1

26. 12.1825

27. 15.1543

28. $2330.65

29. $448.30

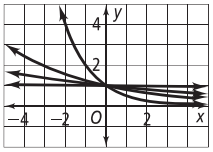
30. $1819.76

31. $6168.41

32. about 10.7 years

33. The graph of $f(x) = \left(\frac{1}{3}\right)^{x+2}$ is a shift of the parent function 2 units left and 1 unit up.

34. If c < 0, the graph models exponential decay.
If c = 0, the graph is a horizontal line.
If c > 0, the graph models exponential growth.

35. 

As the value of b approaches 1, the graph comes closer to being a straight line.

36. $y = 50\left(\frac{1}{2}\right)^{\frac{1}{143}x}$; 0.85 mg

37. $y = 24\left(\frac{1}{2}\right)^{\frac{1}{5730}x}$; 0.64 mg

38. $y = 4\left(\frac{1}{2}\right)^{x}$; $y = 4\left(\frac{1}{2}\right)^{x+4} + 3$

39. $y = -3^{x}$; $y = -3^{x-8} + 2$

40. $y = \frac{1}{2}(2)^{x}$; $y = \frac{1}{2}(2)^{x-6} - 7$

41. $y = -3\left(\frac{1}{3}\right)^{x}$; $y = -3\left(\frac{1}{3}\right)^{x+15} - 1$

42. about 61.4 pascals

43a. about 8 names; about 20 names

43b. Graphically, it will never happen. The graph has $y = 25$ as an asymptote. (In reality, you would be close to knowing all the names in about 21 days.)

43c. Answers may vary. Sample:
My learning rate might be higher since I can learn names quickly.

44a. 9168 ft^3

44b. $V = 9168 - 405\left(2^{x} - 1\right)$
about 5 weekends

45. C

46. G

47. A

48. H

49. C

50. $A = Pe^{rt}$
$8000 = Pe^{(0.06)(4)}$
$\frac{8000}{e^{(0.06)(4)}} = P$
$P = 6293.022889$
$P = \$6293.02$
To have exactly $8000 after four years, you should invest $6293.02.

51. exponential growth; 23

52. exponential growth; 3

53. exponential decay; 2

54. exponential growth; 5

55. $6\sqrt{5}$

56. $-\sqrt[3]{4}$

57. $5\left(\sqrt{3} + \sqrt{5}\right)$

58. $2\left(\sqrt[4]{2}+\sqrt[4]{8}\right)$

59. $\sqrt{3}$

60. $11\sqrt{7}$

61. $f^{-1}(x)=\dfrac{x+1}{4}$; yes

62. $f^{-1}(x)=x^{\frac{1}{7}}$; yes

63. $f^{-1}(x)=\left(\dfrac{x-1}{5}\right)^{\frac{1}{3}}$; yes

Algebra 2
Lesson 7-3 - Practice and Problem-Solving Exercises Answers

12. $\log_7 49 = 2$

13. $\log 1000 = 3$

14. $\log_5 625 = 4$

15. $\log \frac{1}{10} = -1$

16. $\log_8 64 = 2$

17. $\log_{\frac{1}{2}} 4 = -2$

18. $\log_{\frac{1}{3}} \frac{1}{27} = 3$

19. $\log 0.01 = -2$

20. 4

21. $\frac{1}{2}$

22. **1**

23. $\frac{3}{2}$

24. 3

25. $\frac{1}{2}$

26. undefined

27. 2

28. 5

29. 1

30. 4

31. 3

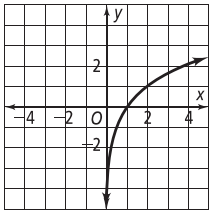
32. The earthquake in Missouri was about 1.58 times as intense.

33. The earthquake in Chile was about 39.81 times as intense.

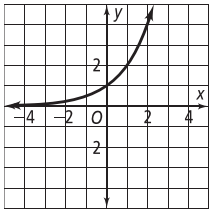
34. The earthquake in Missouri was about 50,119 times as intense.

35. The earthquake in Missouri was about 10 times as intense.

36.



37.



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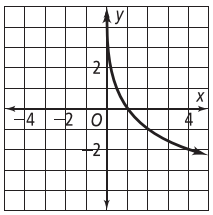

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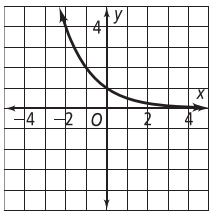


40. translate the graph 1 unit up

41. translate the graph 2 units to the right

42. translate the graph 5 units to the right and 3 units up

43. translate the graph 2 units to the left and 1 unit down

44. apple juice: acidic; buttermilk: acidic; cream: acidic; ketchup: acidic; shrimp sauce: basic; strained peas: acidic

45. $\approx 3.16 \times 10^{-9}$

46. $2^7 = 128$

47. $10^{-4} = 0.0001$

48. $6^1 = 6$

49. $4^0 = 1$

50. $7^5 = 16{,}807$

51. $2^{-1} = \frac{1}{2}$

52. $3^{-2} = \frac{1}{9}$

53. $10^1 = 10$

54. 0

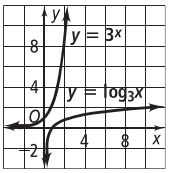
55. -2

56. 1

57. 7

58. error in the second line; it should read $27^x = 3$; the correct answer is $\frac{1}{3}$.

59. First rewrite $y = \log_1 x$ as $1^y = x$.
For any real number y, $1^y = 1$.
So, the only possible value for x is 1.

60. Answers may vary. Sample:
$y = \log_3 x$
$y = 3^x$


61. $y = 4^x$

62. $y = 0.5^x$

63. $y = 10^x$

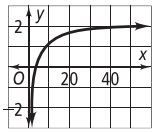
64. $y = 2^{x-1}$

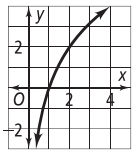
65. $y = 10^x - 1$

66. $y = 10^{x-1}$

67. $y = 2^{x-2}$

68. $y = 10^x + 6$

69.


70.


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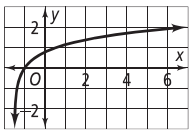

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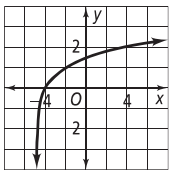


73. domain: $x > 0$
range: all real numbers

74. domain: $x > 0$
range: all real numbers

75. domain: $x > 3$
range: all real numbers

76. domain: $x > 2$
range: all real numbers

77. $4 = \log_3(81)$

78. $4 = \log_x(y)$

79. $8 = \log_6(a+1)$

80. 4

81. 3

82. 3

83. -2

84a. II

84b. III

84c. I

85. D

86. I

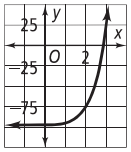
87. C

88. $\sqrt[3]{\left(\sqrt{a}\right)^7} = \sqrt[3]{(a)^{\frac{7}{2}}}$

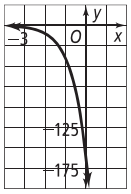
$= \left((a)^{\frac{7}{2}}\right)^{\frac{1}{3}}$

$= a^{\frac{7}{6}}$

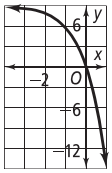
89.



90.



91.



92. $(2x-3)(2x-1)$

93. $4(b-5)(b+5)$

94. $(5x-2)(x+3)$

95. 2

96. 256

97. $\frac{1}{4}$

98. 12

Algebra 2
Lesson 7-4 - Practice and Problem-Solving Exercises Answers

9. $\log 14$

10. $\log_2 3$

11. $\log 972$

12. $\log \frac{2}{3}$

13. $\log \frac{m^4}{n}$

14. $\log \frac{5}{2^k}$

15. $\log_6 5x$

16. $\log_7 \frac{xy}{z}$

17. $\log_3 32xy$

18. $3 \log x + 5 \log y$

19. $2 + \log_7 x + \log_7 y + \log_7 z$

20. $1 - \log_b x$

21. $2 \log a$

22. $\log_5 r - \log_5 s$

23. $2 \log_3 2 + 2 \log_3 x$

24. $\log_3 7 + 2 \log_3 (2x - 3)$

25. $2 \log a + 3 \log b - 4 \log c$

26. $\log_4 5 + \frac{1}{2} \log_4 x$

27. $1 + \frac{1}{2} \log_8 3 + \frac{5}{2} \log_8 a$

28. $2 - \log_5 x$

29. $1 + 4 \log m - 2 \log n$

30. ≈ 3.17

31. ≈ 1.2

32. ≈ 1.748

33. ≈ 1.43

34. ≈ 1.4

35. ≈ 3.631

36. ≈ 2.564

37. ≈ 3.183

38. 12

39. -2

40. 5

41. 1

42. 2

43. 2

44. $-\frac{1}{2}$

45. Yes; the explosion is in violation of town regulations because the loudness of the sound is 102 dB and exceeds the limit of 100 dB.

46. about 3 dB

47. The coefficient $\frac{1}{2}$ is missing in $\log_4 s$.

$$\log_4 \sqrt{\frac{t}{s}} = \frac{1}{2} \log_4 \frac{t}{s}$$
$$= \frac{1}{2} \left(\log_4 t - \log_4 s\right)$$
$$= \frac{1}{2}\log_4 t - \frac{1}{2}\log_4 s$$

48. No; the expression $(2x+1)$ is a sum, so it is not covered by the Production, Quotient, or Power Properties.

49. The log of a product is equal to the sum of the logs: $\log (MN) = \log M + \log N$.

50. true; $\log_2 4 = 2$ and $\log_2 8 = 3$; 2 + 3 = 5

51. false;

$$\log_3 \frac{3}{2} = \log_3 3 - \log_3 2$$
$$\frac{1}{2} \log_3 3 = \log_3 3^{\frac{1}{2}}$$
$$\log_3 3 - \log_3 2 \neq \log_3 3^{\frac{1}{2}}$$

52. false; $\log(x-2) \neq \frac{\log x}{\log 2}$

53. false; $\log_b \frac{x}{y} = \log_b x - \log_b y \neq \frac{\log_b x}{\log_b y}$

54. false; $\log x^2 = 2 \log x \neq (\log x)(\log x)$

55. false; $\log_4 7 - \log_4 3 = \log_4 \frac{7}{3} \neq \log_4 4$

56. $\log_3 \sqrt[4]{2x}$

57. $\log x\frac{2\sqrt{y}}{z^3}$

58. $\log_4 \frac{m^x n^{\frac{1}{y}}}{p}$

59. $\log_b \frac{x^{\frac{2}{3}} y^{\frac{3}{4}}}{z^5}$, *or* $\log_b \frac{\sqrt[3]{x^2}\sqrt[4]{y^3}}{z^5}$

60. $\frac{1}{2} \log 2 + \frac{1}{2} \log x - \frac{1}{2} \log y$

61. $\log s + \frac{1}{2} \log 7 - 2 \log t$

62. $3 \log 2 + \frac{3}{2} \log x - 3 \log 5$

63. $3 \log m - 4 \log n + 2 \log p$

64. $3 \log 2 + \frac{1}{2} \log r - \log s$

65. $\frac{1}{2} \log_b x + \frac{2}{3} \log_b y - \frac{2}{5} \log_b z$

66. $\frac{5}{2} \log_4 x + \frac{7}{2} \log_4 y - \log_4 z - 4 \log_4 w$

67. $\frac{1}{2} \log(x+2) + \frac{1}{2} \log(x-2) - 2 \log(x+3)$

68. $\frac{\log 2}{\log 7}$

69. $\frac{\log 8}{\log 3}$

70. $\frac{\log 140}{\log 5}$

71. $\frac{\log 3.3}{\log 9}$

72. $\frac{\log 3x}{\log 4}$

73. A 1.0 magnitude star is about 2.5 times brighter than a 2.0 magnitude star.

74. Capella is about 1.02 times brighter than Rigel.

75. $\frac{1}{2} \log x + \frac{1}{4} \log 2 - \log y$

76. $3 \log_3 \left[(xy)^{\frac{1}{3}} + z^2\right]$

77. $\frac{1}{2} \log_7 (r+9) - 2 \log_7 s - \frac{1}{3} \log_7 t$

78. -1

79. 0

80. B

81. I

82. C

83. Answers may vary. Samples:

$\log 18 = \log \frac{36}{2}$

$= \log 36 - \log 2$

Quotient Property

$\log 18 = \log(2)(9)$

$= \log 2 + \log 9$

Product Property

$\log 18 = \log 324^{\frac{1}{2}}$

$= \frac{1}{2} \log 324$

Power Property

$\log 18 = \log(2)(3)^2$

$= \log 2 + 2 \log 3$

Product and Power Properties

84. $\log_7 49 = 2$

85. $\log_8 \frac{1}{4} = -\frac{2}{3}$

86. $\log_5 \frac{1}{125} = -3$

87. ± 8

88. $\frac{64}{7}$

89. 2

90. $x^3 + 5x^2 - 3x - 15$

91. $x^4 + 17x^2 + 16$

92. $x^4 - 2x^3 - 2x^2 + 14x - 35$

93. 2

94. 3

95. $\frac{1}{3}$

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

7. 3

8. $\frac{3}{2}$

9. 1

10. -1

11. $\frac{4}{5}$

12. -1

13. 2

14. $\frac{2}{5}$

15. ≈ 1.5850

16. ≈ 2.1240

17. 3

18. ≈ 3.4650

19. ≈ 0.9534

20. ≈ 3.2056

21. ≈ 0.2720

22. ≈ 2.1073

23. ≈ 0.5690

24. ≈ 1.2871

25. ≈ 4.7027

26. ≈ 14.4894

27. ≈ 6

28. ≈ 4.89

29. ≈ 0.64

30. ≈ 1.25

31. during 2012

32. 0.05

33. $\frac{\sqrt{10}}{10}$ or ≈ 0.3162

34. 33

35. 10,000

36. $\frac{1}{60}$ or 0.0167

37. $\sqrt{10}$ or ≈ 3.1623

38. $100\sqrt{10} - 1$ or ≈ 315.2

39. 2

40. 3×10^8

41. $100{,}000\sqrt{5}$ or $\approx 223{,}606.8$

42. 5

43. $\frac{1}{4}$

44. ≈ 1357.2

45. 7

46. 5.8

47a. ≈ 18.9658

47b. ≈ 18.9658

47c. Answers may vary. Sample:
You don't have to use the Change of Base Formula with the base-10 method, but there are fewer steps with the base-2 method.

48. about 5.2

49. about 7.6 years

50. -1

51. 3

52. $\frac{1}{2}$

53. 3

54. $\frac{1}{3}$

55. -2

56. 3

57. $-\frac{1}{2}$

58a. 13 years after July 2007

58b. 35 years after July 2007

58c. 25 years after July 2007

59. Answers may vary. Sample:
$\log x = 1.6$
$x = 10^{1.6}$
$x \approx 39.81$

60. 1.1201

61. 143.6

62a. $1\ \text{W/m}^2$; $10^4\ \text{Wm}^2$

62b. 10,000 times as intense

63a. top up: $10^{-5}\ \text{W/m}^2$; top down: $10^{-2.5}\ \text{W/m}^2$

63b. $\approx 99.68\%$

64. ≈ 2.9315

65. 625

66. $\sqrt{\frac{16}{3}}$ or ≈ 2.3094

67. 10

68. ≈ 0.8505

69. 1.5

70. 200.8

71. ≈ 2.7944

72. $5^{3x} = 125$
$5^{3x} = 5^3$
$3^x = 3$
$x = 1$

73. 500

74. ≈ 1.0451

75. $114.\overline{3}$

76. $x = 6$; $y = 1024$

77. $x = 2$; $y = 2$

78. $x = 6$; $y = 2$

79. $x = 5$ or $x = -2$

80. $x = -4$, or $x = 2$

81. 1

82. approximately 20,031 meters above sea level

83a. bassoon, guitar, harp, violin, viola, cello

83b. bassoon, guitar, harp, cello, bass

83c. harp, violin

83d. harp, violin

84. 4

85. 333

86. 25

87. 4

88. 18

89. $\log 2 + 3 \log x - 2 \log y$

90. $\log_3 x - \log_3 y$

91. $1 + \frac{1}{2} \log_3 x$

92. $x^2 - 3x - 1$

93. $3x^2 - 3$

94. $9x^2 - 1$

95. $1, \pm i$

96. $\pm 2, \pm 2i$

97. $\pm\sqrt{3}; \pm\sqrt{2}$

98. $\log_2 3$

99. $\log 3x^4$

100. $\log_7 \frac{32}{y^2}$

Algebra 2
Lesson 7-6 - Practice and Problem-Solving Exercises Answers

11. $\ln 125$

12. $\ln 18$

13. $\ln 4$

14. $\ln \frac{m^5}{n^3}$

15. $\ln \frac{\sqrt[3]{xy}}{z^4}$

16. $\ln \frac{a\sqrt[3]{c}}{b^2}$

17. $\ln 40{,}960$

18. $\ln \frac{1}{81}$

19. $\ln 1$

20. ≈ 134.476

21. ≈ 0.135

22. $\approx 1.078 \times 10^{15}$

23. $\approx \pm 11.588$

24. ≈ 110.196

25. $\approx \pm 2.241$

26. $\approx \pm 0.908$

27. ≈ 1488.979

28. 5.482 or -3.482

29. ≈ 2.890

30. ≈ 5.493

31. ≈ 1.242

32. ≈ 3.219

33. ≈ 2.401

34. ≈ 1.151

35. 0

36. ≈ 23.752

37. ≈ 2.2

38. 7.79 km/s; yes

39. at least 25 seconds

40. approximately 16,384 years old

41. approximately 11,552 years old

42. 0

43. $\frac{1}{4}$

44. 1

45. 83

46. 1

47. 2

48. 10

49. 10

50. 3

51. $\frac{1}{2}$

52. $\log e \neq 1$; $\ln 100 = \dfrac{\log 100}{\log e} = \dfrac{\log 10^2}{\log e} = \dfrac{2}{\log e} \approx 4.61$

53. about 301 days

54. sometimes

55. never

56. always

57. 10.8
The rocket has a mass ratio of 10.8.

58. about 5.8% per hour

59. about 19.8 hours

60. $\approx 27{,}347.9$

61. ≈ 78.342

62. no solution

63. Because the function is simplified in the beginning and the square root of the exponential function is not calculated.

64a. $y = 1.5e^{0.12104t}$

64b. 2010

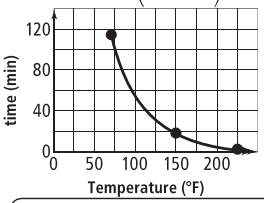
64c. 2018

64d. $t = \dfrac{\ln\left(\dfrac{y}{1.5}\right)}{0.12104}$

64e. Substitute the number of users, y, found in (b) and (c) into the equation in (d). Determine whether your answers in years are the same as t for each.

65a. about 43 minutes

65b. $t = -\dfrac{1}{0.041}\ln\left(\dfrac{T-72}{164}\right)$



Temperature (°F)	225	200	175	150	125	100	75
Minutes Later	1.7	6.0	11.3	18.1	27.6	43.1	97.6

66. approximately 5.78%

67. 4

68. 958

69. 19

70. 3

71. 3

72. 4

73. ≈ 2.846

74. ≈ 0.272

75. $3333.\overline{3}$

76. ≈ 1.002

77. 9.0×10^{-5}

78. $y = \dfrac{x-7}{5}$; yes

79. $y = \sqrt[3]{\dfrac{x-10}{2}}$; yes

80. $y = \pm\sqrt{5-x}$; no

81. $y = \dfrac{x-2}{3}$; yes

82. 10

83. 15

84. $\frac{6}{5}$