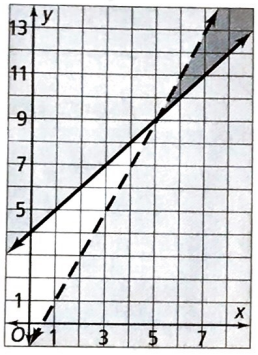
and $(-1, -1)$ and the other passing through $(-1, 1)$ and $(1, -1)$. Four triangles are formed by these lines; upper, left, and lower ones are shaded. Right triangle is not shaded.

Chapter Review pp. 408–410

1. inconsistent **2.** elimination **3.** system of linear equations **4.** $(-8, -11)$ **5.** $(-2, 6)$ **6.** $(-3, -3)$ **7.** no solution **8.** $\left(-\frac{14}{3}, -\frac{35}{3}\right)$ **9.** infinitely many solutions **10.** 4 yr **11.** The lines will be parallel. **12.** (4, 7) **13.** (3, −10) **14.** no solution **15.** $(-1, -2)$ **16.** infinitely many solutions **17.** $\left(-\frac{11}{17}, -\frac{188}{17}\right)$ **18.** \$55 **19.** no solution **20.** $(-1, 13)$ **21.** $(-11, -7)$ **22.** (5, 12) **23.** (4.5, 3) **24.** infinitely many solutions **25.** small centerpiece: 25 min, large centerpiece: 40 min

26.



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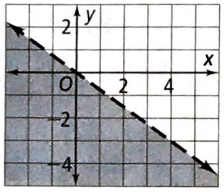

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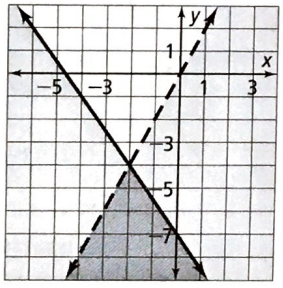

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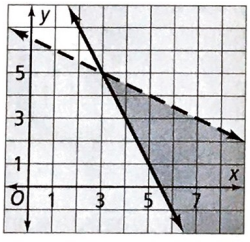

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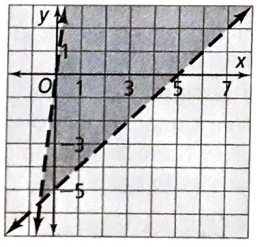

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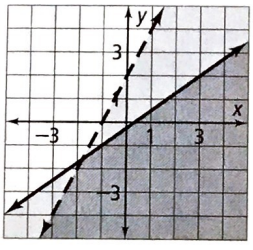

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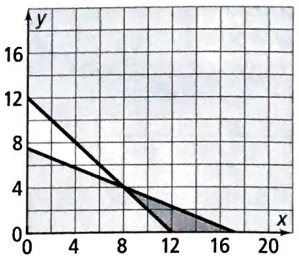


Chapter 7

Get Ready! p. 415

1. 0.7 **2.** 6.4 **3.** 0.008 **4.** 3.5 **5.** $0.\overline{27}$ **6.** 49 **7.** 5.09 **8.** 0.75 **9.** 4 **10.** 16 **11.** 4 **12.** 2000 **13.** −147 **14.** 100 **15.** 49 **16.** 117 **17.** −31 **18.** 33% increase **19.** 25% decrease **20.** 17% decrease **21.** 5% increase **22.** {−8, 0, −24.5} **23.** {18, 10, −32.875} **24.** {−11, −1, 16.5} **25.** yes; how quickly the plant grows **26.** The quantity would increase rapidly. **27.** decreasing

Lesson 7-1 pp. 418–423

Got It? **1a.** $\frac{1}{64}$ **b.** 1 **c.** $\frac{1}{9}$ **d.** $\frac{1}{6}$ **e.** $\frac{1}{16}$ **2a.** $\frac{1}{x^9}$ **b.** n^3 **c.** $\frac{4b}{c^3}$ **d.** $2a^3$ **e.** $\frac{1}{m^2n^5}$ **3a.** $\frac{1}{16}$ **b.** $-\frac{1}{50}$ **c.** $\frac{1}{15{,}625}$ **d.** $-\frac{5}{2}$ **e.** It is easier to simplify first. That gives you, $1 \times 1 = 1$. **4.** 600 represents the number of insects 2 weeks before the population was measured; 5400 represents the population when it was measured; 16,200 represents the number of insects 1 week after the population was measured.

Lesson Check **1.** $\frac{1}{32}$ **2.** 1, $m \neq 0$ **3.** $\frac{5s^2}{t}$ **4.** $4x^3$ **5.** −2 **6.** $\frac{1}{8}$ **7.** division **8.** b^0 is equal to 1, not 0; $\frac{x^n}{a^{-n}b^0} = \frac{a^n x^n}{1} = a^n x^n$

Exercises **9.** $\frac{1}{9}$ **11.** $\frac{1}{25}$ **13.** $\frac{1}{16}$ **15.** −1 **17.** 1 **19.** $0.\overline{4}$ or $\frac{4}{9}$ **21.** $4a$, $b \neq 0$ **23.** $\frac{5}{x^4}$ **25.** $\frac{1}{9n}$ **27.** $\frac{3}{x^2y}$ **29.** $\frac{1}{c^5d^7}$ **31.** $4s^3$ **33.** $\frac{6}{ac^3}$, $d \neq 0$ **35.** $\frac{t^7}{u^{11}}$ **37.** $-\frac{1}{27}$ **39.** −225 **41.** $\frac{4}{5}$ **43.** $\frac{25}{81}$ **45.** 100; there were 100 visitors 4 months before the number of visitors was measured. **47.** negative **49.** negative **51.** 10^{-1} **53.** 10^{-3} **55a.** 5^{-2}, 5^{-1}, 5^0, 5^1, 5^2 **b.** 5^4 **c.** a^n **57.** $4gh^{-3}$ **59.** $\frac{8c^5d^{-4}e^2}{11}$ **61.**

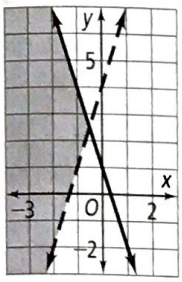
n	3	$\frac{1}{6}$	7	$\frac{5}{8}$	2
n^{-1}	$\frac{1}{3}$	6	$\frac{1}{7}$	$\frac{8}{5}$	0.5

63. Answers may vary. Sample: Let $a = \frac{2}{3}$, then $a^{-1} = \frac{3}{2}$, $a^2 = \frac{4}{9}$, and $a^{-2} = \frac{9}{4}$. **65.** No; answers may

vary. Sample: $3x^{-2} = \frac{3}{x^2}$ which is not the reciprocal of $3x^2$.

67. 21 **69.** $8 - 48m^2$ **71.** -1 and 1 **73.** 1 **75.** 4.5 **77.** 4

78.



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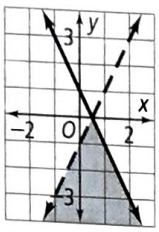

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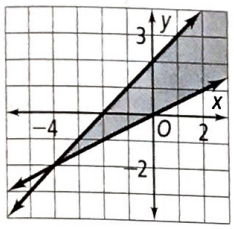


81. $y = -x + 4$
82. $y = 5x - 2$
83. $y = \frac{2}{5}x - 3$
84. $y = -\frac{3}{11}x - 17$
85. $y = \frac{5}{9}x + \frac{1}{3}$
86. $y = 1.25x - 3.79$
87. 60,000
88. 0.07 **89.** 820,000 **90.** 0.003 **91.** 340,000

Lesson 7-2 pp. 425–431

Got It? **1a.** 8^9 **b.** $(0.5)^{-11}$ **c.** 9^5 **2a.** $15x^{14}$ **b.** $-56cd^2$ **c.** $\frac{12j^3}{k^2}$ **d.** Since they have like bases, you keep the same base and add the exponents; $x^a \cdot x^b \cdot x^c = x^{(a+b+c)}$ **3.** 6.7×10^{30} molecules of water **4a.** 2 **b.** 3 **c.** 8 **5a.** 125 **b.** 9 **c.** 8 **6a.** $4c^{\frac{4}{5}}$ **b.** $n^{\frac{5}{3}}$ **c.** $b^{\frac{10}{9}}c^{\frac{13}{10}}$ **d.** $441j^{\frac{5}{6}}m^{\frac{7}{4}}$

Lesson Check **1.** 8^{12} **2.** $6n^{\frac{17}{12}}$ **3.** 2.4×10^{10} **4.** 39,900 km **5.** No; x and y are not like bases and they do not share a common factor. **6.** Sometimes; if the product ab is greater than 10, then the number will not be in scientific notation. **7.** No; $4 \times 3 = 12$ and $\frac{1}{2} + \frac{1}{5} = \frac{7}{10}$ so the correct result is $12a^{\frac{7}{10}}$.

Exercises **9.** $(-6)^{19}$ **11.** 2^9 **13.** $(-8)^0$ **15.** $5c^{10}$ **17.** $\frac{y^3}{x}$ **19.** $\frac{-240m^3}{r}$ **21.** 8.84×10^7 mi **23.** 5 **25.** 8 **27.** 16,384 **29.** $196d^{\frac{7}{3}}g^{\frac{7}{3}}$ **31.** 9 **33.** $\frac{1}{2}$ **35.** $\frac{1}{6}$ **37.** 3.42×10^{34} molecules **39.** 2.7×10^{-8} **41.** 8×10^{-8} **43.** $\frac{1}{a}$ **45.** $-12x^6 + 40x^4$ **47.** 3^4 **49.** $(2^{x+y})\left(3^{\frac{5}{4}}\right)$ **51.** $(t+3)^{\frac{6}{5}}$ **53.** 22.5 times **55.** H **57.** H **59.** (3, 2) **60.** (−4, −5) **61.** (4, 7) **62.** 18, 34, 46 **63.** −1, 7, 13 **64.** −6.8, −22.8, −34.8 **65.** $\frac{1}{16}$ **66.** $5x$ **67.** $\frac{4n^2}{m}$ **68.** $\frac{-3x^3z^6}{y^2}$

Lesson 7-3 pp. 432–438

Got It? **1a.** p^{20} **b.** p^{20} **c.** $p^{\frac{1}{8}}$ **d.** $p^{\frac{1}{8}}$ **e.** yes; $(a^m)^n = a^{mn} = (a^n)^{(m)}$ **2a.** $\frac{1}{x^{22}}$ **b.** w^3 **c.** s^4 **3a.** $343m^{27}$ **b.** $\frac{1}{16z^4}$ **c.** $\frac{1}{9g^8}$ **4a.** $81y^{20}$ **b.** $81c^{16}$ **c.** $\frac{5400b^3}{a^3}$ **5.** about 1.125×10^{10} joules of energy

Lesson Check **1.** n^{18} **2.** $\frac{1}{b^{21}}$ **3.** $81a^2$ **4.** $81x^{20}$ **5.** 1.6×10^{11} **6.** 3.2×10^{-14} **7.** Answers may vary. Sample: When you raise a power to a power you multiply the exponents. When you multiply powers with the same base, you add the exponents. **8.** The second student; when you add like terms you add the coefficients and keep the same variable part. **9.** Answers may vary. Sample: x^2, $(x^3)^{\frac{2}{3}}$, $\left(x^{\frac{2}{5}}\right)^5$, $(x^5)^{\frac{2}{5}}$

Exercises **11.** n^{32} **13.** x^4 **15.** $\frac{1}{x^{\frac{3}{10}}}$ **17.** $z^{\frac{1}{2}}$ **19.** $c^{\frac{1}{3}}$ **21.** $\frac{x^{\frac{1}{12}}}{m^3}$ **23.** $\frac{1}{49a^2}$ **25.** $\frac{1}{6g^2}$ **27.** $\frac{1}{8y^{\frac{7}{3}}}$ **29.** $\frac{y^{\frac{19}{3}}}{z^{\frac{1}{2}}}$ **31.** $32j^{35}k^{11}$ **33.** $\frac{j^{32}}{32k^{26}}$ **35.** 1.024×10^{13} **37.** 8×10^{-9} **39.** 2.56×10^{22} **41.** 1.3312053×10^{25} **43.** 4 **45.** $\frac{6}{7}$ **47.** $-\frac{1}{8}$ **49.** -2 **51.** -3 **53.** $243x^3$ **55.** $b^{\frac{2}{3}}$ **57.** $-8a^5b^4$ **59.** 0 **61.** 9 **63a.** The student did not simplify the expression inside the parentheses first. **b.** 25 **65.** yes; $(7xyz)^2$ **67.** 3 **69.** 1 **71.** 4 **73.** 10; $(2x)^4$, $(4x^2)^2$, $(16x^4)^1$, $(-2x)^4$, $(-4x^2)^2$, $\left(\frac{1}{2}x\right)^{-4}$, $\left(\frac{1}{4}x^2\right)^{-2}$, $\left(\frac{1}{16}x^4\right)^1$, $\left(\frac{1}{-2x}\right)^{-4}$, $\left(\frac{1}{-4x^2}\right)^{-2}$

Lesson 7-4 pp. 439–445

Got It? **1a.** $y^{\frac{1}{4}}$ **b.** $d^{\frac{1}{2}}$ **c.** $\frac{k^5}{j^3}$ **d.** $\frac{b^5}{a^8}$ **e.** y^4z^7 **2.** about 169 people per square mile **3a.** $\frac{16}{x^6}$ **b.** Answers may vary. Sample: You can simplify within the parentheses first to give you $\left(a^{-\frac{17}{4}}\right)^4 = a^{-17}$ or you can raise the quotient to a power first, $\left(\frac{a^3}{a^{20}}\right) = a^{-17}$. **4.** $\frac{25b^2}{a^2}$

Lesson Check **1.** $\frac{1}{y^7}$ **2.** $\frac{x^{12}}{27}$ **3.** $\frac{n^3}{m^3}$ **4.** $\frac{625y^{16}}{81x^8}$ **5.** 27 cubes **6.** In raising a quotient to a power, the exponent goes to all the factors of both the numerator and the denominator and in raising a product to a power, the exponent goes to all the factors.
7a. Answers may vary. Sample: g^3 can be rewritten as $\frac{1}{g^{-3}}$, so $\frac{g^3}{g^7} = \frac{1}{g^7} \cdot \frac{1}{g^{-3}}$.

Exercises **9.** $\frac{1}{3}$ **11.** 0 **13.** 3 **15.** n^3 **17.** y^2 **19.** $\frac{2m^4}{n^4}$ **21.** $\frac{t^{11}}{27m^2}$ **23.** $\frac{3b^7}{a^6c^8}$ **25.** 4×10^{-5} **27.** 4.2×10^3 **29.** 7×10^{-3} **31.** about 4.4×10^{-2} deer per acre **33.** $\frac{9}{64}$ **35.** $\frac{81x^4}{y^4}$ **37.** $\frac{216}{15{,}625}$ **39.** $\frac{262{,}144}{n^{30}}$ **41.** $\frac{5}{2}$ **43.** $\frac{25y^8}{49x^3}$

45. $\frac{x}{25}$ **47.** b^{31} **49.** 5^3 should be 125. **51.** Each factor should be raised to the fourth power and simplified.
53. The base d should only appear once.
55a. about 1636 h **b.** about 31 h **57.** dividing powers with the same base, definition of negative exponent
59. raising a power to a power, dividing powers with the same base, definition of negative exponent **61.** $\frac{1}{16m^8}$
63. a^4 **65.** $\frac{1}{a^9}$ **67.** $\frac{y^{10}}{2x^5}$ **69.** Answers may vary. Samples are given.

I. $\left(\frac{3}{x^2}\right)^{-3} = \left(\frac{x^2}{3}\right)^3$ Rewrite using the reciprocal.

$= \frac{(x^2)^3}{3^3}$ Raise the numerator and denominator to the third power.

$= \frac{x^6}{27}$ Simplify.

II. $\left(\frac{3}{x^2}\right)^{-3} = \frac{3^{-3}}{(x^2)^{-3}}$ Raise a quotient to a power rule

$= \frac{3^{-3}}{x^{-6}}$ Power to a power rule

$= \frac{x^6}{3^3}$ Definition of negative exponent

$= \frac{x^6}{27}$ Simplify.

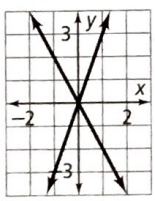
III. $\left(\frac{3}{x^2}\right)^{-3} = \left(\frac{x^2}{3}\right)^3$ Rewrite using the reciprocal.

$= \frac{x^2}{3} \cdot \frac{x^2}{3} \cdot \frac{x^2}{3}$ Definition of an exponent

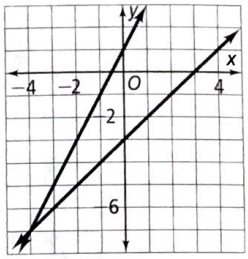
$= \frac{x^6}{27}$ Simplify.

71. $\frac{x^6}{9y^8}$ **73.** $\frac{2}{27}$ **75.** $\frac{c^6}{a^{18}b^6}$ **77.** $\frac{y^6}{256x^2}$ **79.** about $3\frac{1}{3}$ m
81. $x = 7$ and $y = 4$; use the two given expressions to find the system of equations, $x - y = 3$ and $x - 3y = -5$. Solve the system to find the values of x and y. **83.** $\left(\frac{m}{n}\right)^7$ **85.** $\left(\frac{3x}{2y}\right)^3$ **87a.** a^{-n} **b.** $\frac{1}{a^n}$
c. Since $\frac{a^0}{a^n}$ equals both a^{-n} and $\frac{1}{a^n}$, a^{-n} must equal $\frac{1}{a^n}$, which is the definition of a negative exponent.
89. n^{4x} **91.** $\frac{1}{m^3}$ **93.** About 1.6×10^6 g/m^3 **95.** H
97. The domain is $0 \le b \le 8$ because you can use between 0 and 8 bags. The range is $0 \le A(b) \le 9600$ because $A(0) = 0$ and $A(8) = 9600$.
98. $8m^2$ **99.** $\frac{2s^6}{27}$ **100.** $2c^{\frac{1}{3}}$ **101.** $9r^{\frac{1}{2}}$ **102.** n^{15}

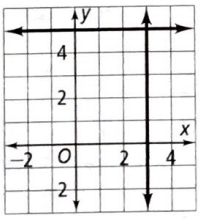
103. (0, 0)



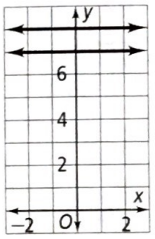
104. (−4, −7)



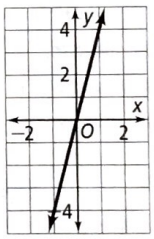
105. (3, 5)



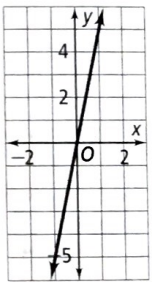
106. no solution



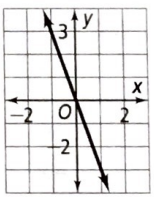
107.



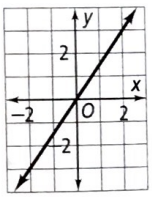
108.



109.



110.



Lesson 7-5 pp. 448–452

Got It? **1a.** 3 **b.** 2 **c.** 4 **d.** 6 **2a.** $\sqrt[6]{a^5}$ **b.** $5\sqrt[3]{x}$ **c.** $9\sqrt[3]{2y^2}$ **3a.** $s^{\frac{2}{3}}$ **b.** $12x^{\frac{4}{3}}$ **c.** $32y^{\frac{5}{2}}$ **d.** $256a^2$ **4.** about 1868.1 Calories per day

Lesson Check **1.** 2 **2.** 3 **3.** 625 **4.** $x^{\frac{1}{2}}$ **5.** $\sqrt[5]{c}$ **6.** $4\sqrt[3]{d^2}$ **7.** $2y^{\frac{3}{4}}$ **8.** Sample answer: The exponent $\frac{2}{3}$ needs to be applied to both 27 and y. Therefore the radical should be written as $\sqrt[3]{(27y)^2}$ and then simplified to $9\sqrt[3]{y^2}$.

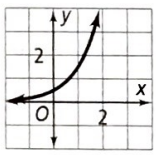
9. Sample answer: To multiply two radicals with the same radicand, first rewrite the expression in exponential form. Then add the exponents. **10.** Sample answer: No; $\sqrt{4^3} - \sqrt{4} = 6$

Exercises **11.** 7 **13.** 5 **15.** 6 **17.** $\sqrt[3]{a^2}$ **19.** $25\sqrt{x}$ **21.** $5\sqrt{x}$ **23.** $7\sqrt{2d}$ **25.** $4\sqrt[3]{(3c)^2}$ **27.** $4c^2$ **29.** $4x^{\frac{2}{3}}$ **31.** $5y^{\frac{3}{4}}$ **33.** $x^{\frac{3}{4}}$ **35.** \$6062.20 **37.** $\sqrt[4]{x^5}$ **39.** $\sqrt{c}\sqrt[6]{d^5}$ **41.** $42x$ **43.** $b^{\frac{2}{3}} - b^{\frac{1}{3}}$ **45.** $2b^{\frac{5}{3}} - 4a^{\frac{3}{4}}$ **47.** y **49.** about 1.17 in. **51.** $3\sqrt{x^3} = 3x^{\frac{3}{2}}$; yes; $4x^{\frac{3}{2}} + 3x^{\frac{3}{2}} = 7x^{\frac{3}{2}}$; yes, $7x^{\frac{3}{2}} = 7\sqrt{x^3}$ **53.** \$7.15 **55.** C **57.** $7s^{\frac{3}{2}}$ **58.** $5t^6$ **59.** $-32x^{20}$ **60.** -6 **61.** $27d^{\frac{3}{2}}$ **62.** $-12c^2$ **63.** $100a^6$ **64.** $-4y^8$ **65.** $9t^{\frac{2}{3}}$ **66.** $4x - y = -7$ **67.** $2x - y = 13$ **68.** $7x + 6y = 12$ **69.** $6x - 3y = -17$ **70.** $x - 6y = 3$ **71.** $9x - 36y = -108$ **72.** Add 3; 12, 15, 18. **73.** Subtract 6; -8, -14, -20. **74.** Increase the denominator by one; $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$. **75.** Add 5; 17, 22, 27. **76.** Subtract 4; -9, -13, -17. **77.** Take next perfect square; 16, 25, 36.

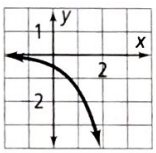
Lesson 7-6 pp. 453–459

Got It? **1a.** Linear; the x-values have a common difference of 1 and the y-values have a common difference of 2. **b.** Yes; the independent variable x is an exponent. **2.** 14,580 rabbits

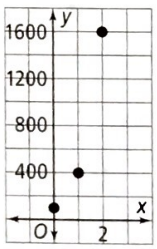
3a.



b.



4a.

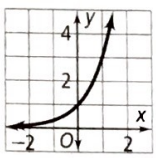


b. 300%

5a. about -1.34 **b.** about -0.45 **c.** about -0.45

Lesson Check **1.** 48 **2.** 5

3.



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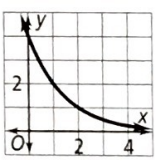
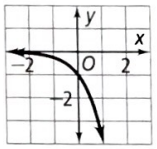


5. Answers may vary. Linear functions have a constant rate of change, while an exponential function has a constant finite ratio. **6.** No; the value of the base cannot be negative. **7.** The student did not use the order of operations correctly. You must evaluate the exponent before you multiply: $f(-1) = 3 \cdot 4^{-1} = 3 \cdot \frac{1}{4} = \frac{3}{4}$.

Exercises **9.** Linear; the x-values have a common difference of 1 and the y-values have a common difference of 3. **11.** Linear; the independent variable x is not an exponent. **13.** Linear; the independent variable x is not an exponent. **15.** 12.5 **17.** -3.44×10^{10} **19.** 4800 foxes

21.



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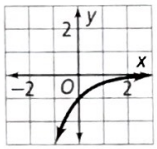

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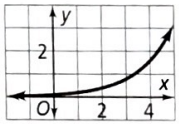

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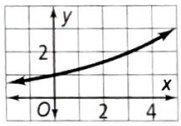

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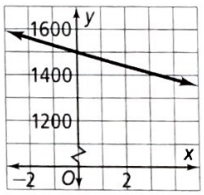


31. about 1.34 and about -2.96

33. {0.16, 0.4, 1, 2.5, 6.25, 15.625}; increase

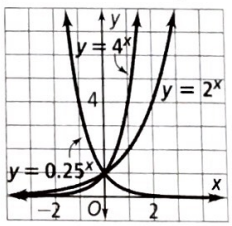
35. {0.3125, 1.25, 5, 20, 80, 320}; increase

37. {0.015625, 0.125, 1, 8, 64, 512}; increase

39. {1111.$\overline{11}$, 333.$\overline{33}$, 100, 30, 9, 2.7}; decrease

41a. $y = 15 \times 2^{\frac{n}{3}}$ **b.** $y = 15 \times 3^{\frac{n}{4}}$

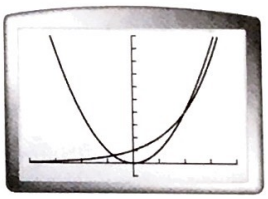
43a.



b. (0, 1) **c.** No; the values of y are always positive. **d.** When $0 < b < 1$, the graph decreases to the right, but when $b > 1$, the graph rises to the right. The larger the value of b, the faster it rises.

45. $f(x) = 200x^2$ **47.** $f(x) = 100x^2$

49a.



b. Answers may vary. Sample: the values are close though the exponential function is greater from 1 to 2, the two functions are equal at $x = 2$, and then the quadratic function is greater from 2 to 3.

c. Answers may vary. Sample: The function values increase more rapidly. **51.** 6 **53.** 3 **55a.** 4 **b.** 3 **c.** $y = 4 \cdot 3^x$ **d.** $\frac{4}{9}$; 324

Lesson 7-7 pp. 460–466

Got It? 1. about 43,872 subscribers; 1.05^m **2.** \$4489.01 **3a.** about 55 kilopascals **b.** The decimal equivalent of 100% is 1.

Lesson Check 1. 4 **2.** 15 **3.** 0.2 **4.** 0.94 **5.** \$32,577.89 **6.** If $b > 1$, then it is exponential growth. If $0 < b < 1$, then it is exponential decay. **7.** The value of $n = 1$ so the formula becomes $A = P(1 + r)^t$. **8.** The student did not convert 3.5% to a decimal; $A = 500\left(1 + \frac{0.035}{4}\right)^{(4 \cdot 2)} = 500(1.00875)^8 \approx 536.09$.

Exercises 9. 14, 2 **11.** 25,600, 1.01 **13a.** 15,000 **b.** 0.04, 1.04 **c.** 1.04 **d.** 15,000, 1.04, x **e.** about 39,988 **15.** \$5352.90 **17.** \$634.87 **19.** \$5229.70 **21.** \$1277.07 **23.** 5, 0w.5 **25.** 100, $\frac{2}{3}$ **27.** about 33,236 **29.** exponential decay **31.** exponential decay **33.** No; the value of the car is about \$5243. **35.** Answers may vary. Sample: $y = -4 \cdot 1.05^x$; this is an exponential function, but it models neither exponential growth nor decay because $a < 0$. **37.** neither **39a.** $P = 400(1.05)^n$, where n is the number of years and P is the profit. **b.** \$5031.16 **41a.** \$220 **b.** \$3.96 **c.** \$223.96 **d.** \$193.96 **e.** 9 months **f.** \$18.07

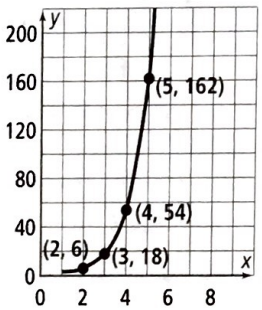
Lesson 7-8 pp. 467–472

Got It? 1a. geometric **b.** arithmetic **c.** geometric **d.** neither geometric nor arithmetic **2a.** $a_n = a_{n-1} + 2$, $a_1 = 2$; $a_n = 2 + (n - 1)(2)$

b. $a_n = a_{n-1} \cdot \left(\frac{1}{2}\right)$, $a_1 = 40$; $a_n = 40 \cdot \left(\frac{1}{2}\right)^{n-1}$

3a. $a_n = a_{n-1} \cdot 6$, $a_1 = 14$; $a_n = 14 \cdot 6^{n-1}$; $a_8 = 3{,}919{,}104$ **b.** $a_n = a_{n-1} \cdot \frac{1}{2}$, $a_1 = 648$; $a_n = 648 \cdot \left(\frac{1}{2}\right)^{n-1}$; $a_8 \approx 5.06$

4. $f(x) = 2 \cdot 3^{x-1}$;



Lesson Check 1. yes; 3 **2.** yes; $\frac{1}{4}$ **3.** no **4.** $a_n = 5 \cdot 4^{n-1}$; $a_n = a_{n-1} \cdot 4$, $a_1 = 5$ **5.** $a_n = 4 \cdot (-2)^{n-1}$; $a_n = a_{n-1} \cdot (-2)$, $a_1 = 4$ **6.** $a_n = 162 \cdot \left(\frac{2}{3}\right)^{n-1}$; $a_n = a_{n-1} \cdot \left(\frac{2}{3}\right)$, $a_1 = 162$

7. $a_n = 3 \cdot (2)^{n-1}$; $a_n = a_{n-1} \cdot (2)$, $a_1 = 3$ **8.** Answers will vary. Sample answer: This is the explicit formula. The recursive formula is $a_1 = 1$, $a_n = a_{n-1} \cdot (-1)$. **9.** Both arithmetic and geometric sequences can increase or decrease. Geometric sequences increase or decrease by a constant ratio. Arithmetic sequences increase or decrease by a constant difference.

Exercises 11. not geometric; no constant ratio **13.** geometric; constant ratio of $\frac{3}{4}$ **15.** geometric; constant ratio of 2 **17.** $\frac{1}{3}$ **19.** 4 **21.** -3 **23.** $a_n = 3 \cdot (2)^{n-1}$ **25.** $a_n = 3 \cdot (-4)^{n-1}$ **27.** $a_n = 686 \cdot \left(\frac{1}{7}\right)^{n-1}$ **29.** $a_1 = 1$, $a_n = a_{n-1} \cdot 5$ **31.** $a_1 = 2$, $a_n = a_{n-1} \cdot (-4)$ **33.** $a_1 = 192$, $a_n = a_{n-1} \cdot \left(\frac{2}{3}\right)$ **35.** $a_n = 48 \cdot \left(\frac{3}{4}\right)^{n-1}$; $a_n = a_{n-1} \cdot \frac{3}{4}$, $a_1 = 48$

37. $f(x) = 8 \cdot 2^{x-1}$; The graph of the function passes through the points (1, 8), (2, 16), (3, 32), (4, 64). **39.** not geometric **41.** geometric; $\frac{1}{7}$; $a_n = 98 \cdot \left(\frac{1}{7}\right)^{n-1}$; $a_1 = 98$, $a_n = a_{n-1} \cdot \frac{1}{7}$

43. geometric; $-\frac{1}{2}$; $a_n = 200 \cdot \left(-\frac{1}{2}\right)^{n-1}$; $a_1 = 200$, $a_n = a_{n-1} \cdot \left(-\frac{1}{2}\right)$ **45.** arithmetic

47. arithmetic **49.** geometric **51.** Check students' answers. **53.** Both sequences triple for each following term. However, the first sequence starts at 5, while the second starts at 10. **55.** G **57.** I

59. $a_n = 0 + 9n$; $a_1 = 0$, $a_n = a_{n-1} + 9$

60. $a_n = 5 + -2n$; $a_1 = 0$, $a_n = a_{n-1} + (-2)$

61. $a_n = -7 + 4n$; $a_1 = -7$, $a_n = a_{n-1} + 4$

62. $x = -8$ **63.** $y = -2$ **64.** $a = \frac{35}{4}$ **65.** 75% increase **66.** 37.5 **67.** $2x + 5y$ **68.** $4a + 2b$ **69.** $-4c + 5d$

Chapter Review pp. 474–478

1. geometric sequence **2.** growth factor **3.** decay factor **4.** exponential growth **5.** exponential decay **6.** 1

7. $\frac{1}{49}$ **8.** $\frac{4y^8}{x^2}$ **9.** $\frac{q^4}{p^2}$ **10.** 9 **11.** $\frac{9}{16}$ **12.** 1 **13.** 45 **14.** $\frac{25}{9}$ **15.** $-\frac{20}{9}$ **16.** No; -3 should be raised to the fourth power instead of multiplying it by 4. **17.** $3^2 \cdot 3^8 = 3^{10}$ **18.** $a^6 \cdot a^2 = a^8$ **19.** $x^2y^5 \cdot x^3y^6 = x^5y^{11}$

20. $a^{\frac{1}{2}} \cdot a^{\frac{1}{2}} = a$ **21.** $x^{\frac{2}{3}} \cdot x^{\frac{3}{4}} = x^{\frac{11}{12}}$ **22.** $m^{\frac{3}{4}}n^{\frac{1}{2}} \cdot m^{\frac{1}{2}}n^{\frac{1}{2}} = m^{\frac{5}{4}}n$ **23.** $2d^5$ **24.** x^7 **25.** $-x^4y^{12}$ **26.** $s^{\frac{19}{15}}$ **27.** $p^{\frac{4}{3}}q^{\frac{3}{2}}$

28. $6mn^3$ **29.** 7.8×10^3 pores **30.** 3 **31.** -5 **32.** 2

33. $\left(x^{\frac{2}{3}}\right)^2 = x^2$ **34.** $\left(a^{\frac{1}{2}}\right)^{\frac{1}{2}} = a^{\frac{1}{4}}$ **35.** $\left(2x^2y^{\frac{1}{4}}\right)^2 = 4x^4y^{\frac{1}{2}}$

36. $q^{12}r^4$ **37.** 1.7956 **38.** $\frac{243x^3y^{11}}{16}$ **39.** $-\frac{4}{3r^{10}z^8}$ **40.** x^4

41. $a^3b^{\frac{7}{2}}$ **42.** $\frac{1}{w^3}$ **43.** $7x^4$ **44.** $\frac{n^{35}}{v^{21}}$ **45.** $\frac{e^{20}}{81c^{12}}$

46. 2×10^{-3} **47.** 2.5×10^2 **48.** 5×10^{-5}

49. 3×10^3 **50.** Answers may vary. Sample:

1) Simplify the expression within the parentheses.
2) Take the reciprocal of the rational expression raised to the third power.
3) Use the quotient raised to a power rule by applying the exponent to both the numerator and denominator.
4) Simplify the numerator.
5) Simplify the denominator using the power rule.

51. $\sqrt{m}$ **52.** $\sqrt[3]{p^2}\sqrt[5]{t^4}$ **53.** $6x^2$ **54.** $5\sqrt[3]{x}$

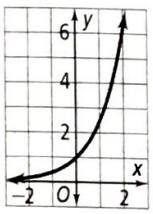
55. $8\sqrt[4]{x^3}$ **56.** $x\sqrt[3]{25}\sqrt{y}$ **57.** $(xy)^{\frac{1}{2}}$ **58.** $a^{\frac{1}{4}}$ **59.** $b^{\frac{2}{3}}$

60. x^2y^3 **61.** $3x^{\frac{1}{2}}$ **62.** $x^{\frac{2}{5}}y^{\frac{3}{5}}$ **63.** 4, 16, 64

64. 0.01, 0.0001, 0.000001 **65.** 20, 10, 5

66. 6, 12, 24

67.



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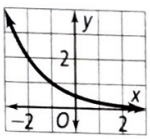

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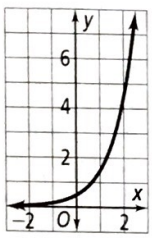

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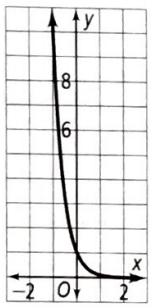

71a. 800 bacteria **b.** about 1.4×10^{16} bacteria

72. exponential growth; 3 **73.** exponential decay; 0.32

74. exponential growth; $\frac{3}{2}$ **75.** exponential decay; $\frac{1}{4}$

76. \$2697.20 **77.** 463 people **78.** 2 **79.** 10 **80.** $\frac{1}{5}$

81. $\frac{1}{3}$ **82.** $a_1 = 20$, $a_n = a_{n-1} \cdot 3$

83. $a_1 = 5$, $a_n = a_{n-1} \cdot \frac{1}{2}$ **84.** $a_1 = 3$, $a_n = a_{n-1} \cdot 4$

85. $a_1 = 10$, $a_n = a_{n-1} \cdot \frac{1}{10}$

Chapter 8

Get Ready! p. 483

1. 1, 2, 3, 4, 6, 12 **2.** 1, 2, 3, 6, 9, 18 **3.** 1, 2, 4, 5, 10, 20, 25, 50, 100 **4.** 1, 3, 9, 27, 81 **5.** 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72 **6.** 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 25, 30, 50, 60, 75, 100, 150, 300 **7.** 1, 2, 5, 10, 25, 50, 125, 250

8. 1, 3, 9, 23, 69, 207 **9.** $x^2 - 9x$ **10.** $3d + 15$

11. $24r^2 - 15r$ **12.** $34m - 29$ **13.** $-36a^2 - 6a$

14. $-s^2 - 7s - 2$ **15.** $25x^2$ **16.** $9v^{\frac{5}{2}}$ **17.** $64c^6$

18. $56m^{\frac{28}{5}}$ **19.** $81b^6$ **20.** $36p^2q^2$ **21.** $7n$ **22.** $-125t^{12}$

23. p^2q^3 **24.** $5x$ **25.** $-\frac{1}{8n^5}$ **26.** $3y^2$ **27.** 3

28. A binomial is an expression with two terms.

29. b; $(x + 4)(x + 4) = (x + 4)^2$, which is a square, and $(x + 4)(x + 4) = x^2 + 8x + 16$, which is a trinomial.

Lesson 8-1 pp. 486–491

Got It? **1a.** 2 **b.** 5 **c.** 0 **2.** $5x^4$, $-5x^2y^4$

3a. $8x^2 + 2x - 3$, quadratic trinomial **b.** Answers may vary. Sample: Writing a polynomial in standard form allows you to see which monomial term has the greatest degree and how many terms the polynomial has.

4. $-12x^3 + 120x^2 - 255x + 6022$

5. $-4m^3 - 4m^2 - 2m + 21$

Lesson Check **1.** 4 **2.** 5 **3.** $11r^3 + 11$

4. $x^2 - 3x - 7$ **5.** quadratic trinomial **6.** linear binomial **7.** The coefficient of the sum of like monomials is the sum of the coefficients. To add polynomials, you group like terms and add their coefficients. A monomial has only one term and a polynomial can have more than one term.

Exercises **9.** 3 **11.** 10 **13.** 0 **15.** no degree

17. $11m^3n^3$ **19.** $14t^4$ **21.** $18v^4w^3$

23. $-8bc^4$ **25.** $-2q + 7$; linear binomial

27. $-7x^2 - 4x + 4$; quadratic trinomial

29. $3z^4 - 2z^2 - 5z$; fourth degree trinomial

31. $9x^2 + 8$ **33.** $20x^2 + 5$ **35.** $-18x^2 + 228x + 2300$

37. $2x^3 + 8$ **39.** $5h^4 + h^3$ **41.** $9x - 1$

43. The student forgot to distribute the negative sign to all the terms in the second set of parentheses.

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

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

$4x^2 - 3x^2 - x + 5x + 3 + 6 =$

$x^2 + 4x + 9$ **45.** $-5y^3 + 2y^2 - 6$

47. $3z^3 + 15z^2 - 10z - 5$ **49.** No. Answers may vary. Sample: $(x^2 - x + 3) + (x - x^2 + 1) = 4$, which is a monomial. **51.** $14pq^6 - 11p^4q - p^4q^4$

Lesson 8-2 pp. 492–496

Got It? **1.** $15n^4 - 5n^3 + 40n$ **2.** $3x$

3a. $3x^2(3x^4 + 5x^2 + 4)$ **b.** $-6x^2(x^2 + 3x + 2)$

4. $9x^2(4 - \pi)$

Lesson Check **1.** $12x^4 + 42x^2$ **2.** $2a^2$ **3.** $3m(2m - 5)$

4. $4x(x^2 + 2x + 3)$ **5.** B **6.** C **7.** A **8.** Answers may vary. Sample: $18x^3 + 27x^2$