Lesson 5.6 • Logarithmic Functions

Name _____ Period _____ Date _____

1. Write an equation for the inverse of each function.

   a. $f(x) = 5^x$ b. $f(x) = \log_2 x$ c. $f(x) = \log x$

2. Rewrite each logarithmic equation in exponential form using the definition of logarithm. Then solve for x.

   a. $\log_2 128 = x$ b. $\log_9 \dfrac{1}{81} = x$ c. $x = \log 0.001$

   d. $\log_{12} \sqrt[4]{12} = x$ e. $x = \log_4 32$ f. $\log 1 = x$

   g. $x = \log_5 125$ h. $\log_8 1 = x$ i. $\log_{20} 20 = x$

   j. $\log_4 \dfrac{1}{16} = x$ k. $x = \log_9 \sqrt[3]{9}$ l. $x = \log 0.00001$

3. Find the exact value of each logarithm without using a calculator. Write answers as integers or fractions in lowest terms.

   a. $\log_2 8$ b. $\log_3 81$ c. $\log_7 49$

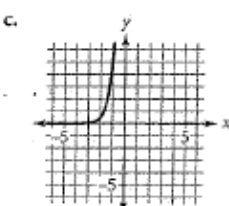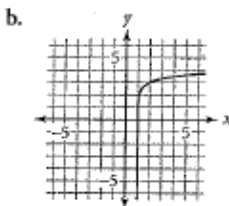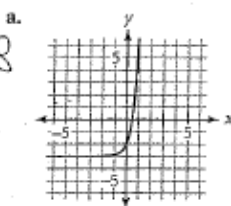   d. $\log_5 \sqrt{5}$ e. $\log_3 \dfrac{1}{3}$ f. $\log_2 \dfrac{1}{32}$

   g. $\log_4 8$ h. $\log_8 4$ i. $\log 1,000,000,000$

4. Each graph is a transformation of either $y = 10^x$ or $y = \log x$. Write the equation for each graph.

   a.   b.   c.

5. Use the change-of-base property to solve each equation. (Round to four decimal places.)

   a. $\log_4 9 = x$ b. $\log_5 120 = x$ c. $\log_3 0.9 = x$

   d. $3^x = 21$ e. $4^x = 99$ f. $6^x = 729$

   g. $2^x = 1.5$ h. $7^x = 4.88$ i. $12^x = 5.75$

   j. $5^x = 0.75$ k. $8^x = 0.523$ l. $20^x = 0.04$

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definition of logarithm. Then solve for x.

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5. Use the change-of-base property to équatibfi. (Round to

four decimal places.)

Lesson 5.4 • Applications of Exponential and Power Equations

Name _____ Period _____ Date _____

1. Solve each equation. If answers are not exact, approximate them to the nearest hundredth.

   a. $x^4 = 48$

   b. $\sqrt[3]{x} = 2.6$

   c. $x^{2/3} = 8.75$

   d. $x^{-1/4} = 0.2$

   e. $0.75x^5 - 8 = -3$

   f. $4(x^{5/6} + 7) = 159$

   g. $128.5 = 36 \cdot x^{2.5}$

   h. $224 = 200\left(1 + \frac{x}{4}\right)^9$

   i. $1500\left(1 + \frac{x}{12}\right)^{6.5} = 1525$

2. Rewrite each expression in the form ax^n.

   a. $\left(8x^9\right)^{2/3}$

   b. $\left(81x^{12}\right)^{3/4}$

   c. $\left(49x^{-10}\right)^{1/2}$

   d. $\left(-27x^{-9}\right)^{4/3}$

   e. $\left(100{,}000x^{10}\right)^{3/5}$

   f. $\left(-125x^{-15}\right)^{1/3}$

   g. $\left(-216x^9\right)^{4/3}$

   h. $\left(16x^{28}\right)^{-5/4}$

   i. $\left(-32x^{-30}\right)^{-6/5}$

3. Give the average annual rate of inflation for each situation described. Give your answers to the nearest tenth of a percent.

   a. The cost of a 20-ounce box of cereal increased from $4.25 to $5.50 over 5 years.

   b. The cost of a gallon of milk increased from $2.75 to $3.40 over 3 years.

   c. The cost of a movie ticket increased from $6.00 to $8.50 over 10 years.

   d. The monthly rent for Hector's apartment increased from $650 to $757 over 4 years.

   e. The starting hourly wage for a salesclerk increased from $5.85 to $7.65 over 6 years.

   f. The value of an antique table increased from $3500 to $5700 over 7 years.

4. The population of a small town has been declining because jobs have been leaving the area. The population was 23,000 in 1996 and 18,750 in 2001. Assume that the population is decreasing exponentially.

   a. Define variables and write an equation that models the population in this town in a particular year.

   b. Use your model to predict the population in 2004.

   c. According to your model, in what year will the population first fall below 12,000?

Lesson 5.4 - Appl'ic~ations ~of Eflaozhentfal 'land Power

Equations

1.

Solve equatioi1_." If answers are not exact, approximate them to the

. Rewrite each expression i_n the form ax".

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Discovering Advanced Algebra More Practice Your Skilis"

Lesson 5.7 • Properties of Logarithms

Name _____ Period _____ Date _____

1. Change the form of each expression below using properties of logarithms or exponents. Name each property you use.

   Pick 5

   a. $\log r - \log s$

   b. $\left(x^y\right)^z$

   c. $\dfrac{1}{a^b}$

   d. $\log_r s$

   e. q^{a+b}

   f. $\log_b x^m$

   g. $(cd)^m$

   h. $\log_b xy$

   i. $\left(\dfrac{r}{s}\right)^m$

   j. $c^{m/n}$

   k. $\dfrac{\log_a x}{\log_a y}$

   l. $t\log_a y$

2. Determine whether each equation is true or false.

   Pick 7

   a. $\log 45 = \log 5 + \log 9$

   b. $\log 8 = \dfrac{\log 32}{\log 4}$

   c. $\log_5 9 - \log_5 2 = \log_5 4.5$

   d. $\log 32 = \dfrac{1}{5}\log 2$

   e. $\log 12 - \log 4 = \log 8$

   f. $\log \dfrac{1}{5} = \dfrac{1}{\log 5}$

   g. $\log 4 = \dfrac{2}{3}\log 8$

   h. $\log \sqrt[3]{5} = \dfrac{1}{3}\log 5$

   i. $\log_2 \dfrac{1}{81} = -2\log_2 9$

   j. $\log \sqrt{6} = -2\log 6$

   k. $\log 75 = 3\log 25$

   l. $\log_3 15 - \log_3 5 = 1$

3. Write each expression as a sum or difference of logarithms (or constants times logarithms). Simplify the result if possible.

   Pick 3

   a. $\log xyz$

   b. $\log_2 \dfrac{xy}{z}$

   c. $\log \dfrac{p^2}{q^3}$

   d. $\log_5 \dfrac{a\sqrt{b}}{c^4}$

   e. $\log_4\left(\sqrt{r}\cdot\sqrt[3]{s}\cdot\sqrt[4]{t^3}\right)$

   f. $\log_3\left(\dfrac{\sqrt[3]{abc}}{\sqrt[4]{x}}\right)$

4. Solve each equation. (Round answers to the nearest hundredth.)

   Do All

   a. $5.2^x = 375$

   b. $82 + 2.5^x = 130$

   c. $32(0.87)^x = 260$

   d. $48(1.04)^x = 90$

   e. $32 + 16(1.035)^x = 315$

   f. $105 + 30(0.95)^x = 210$

Name Period

1. Change the form of each expression below using properties of logarithms or exponents. Name each property you use.

a. logr M logs

3. Write each expression as a sum or difference of logarithms (or constants times .1ogarith1ns). Simplify the resrlit if possible.

d. 1035?

Date

Lesson 5.2 • Properties of Exponents and Power Functions

Name _____ Period _____ Date _____

1. Rewrite each expression as a fraction without exponents. Verify that your answer is equivalent to the original expression using your calculator.

   a. 3^{-2}

   b. 4^{-3}

   c. 5^{-4}

   d. 25^{-1}

   e. 7^{-3}

   f. 10^{-6}

   g. -4^{-4}

   h. $(-4)^{-4}$

   i. $(-5)^{-3}$

   j. $\left(\frac{1}{2}\right)^{-5}$

   k. $-\left(\frac{3}{5}\right)^{-2}$

   l. $\left(-\frac{5}{6}\right)^{-2}$

2. Rewrite each expression in the form x^n or ax^n.

   a. $x^5 \cdot x^8$

   b. $x^{12} \cdot x^{-5}$

   c. $x^{-10} \cdot x^{-5}$

   d. $4x^0 \cdot 9x^8$

   e. $\left(-10x^{-8}\right)\left(-12x^{-3}\right)$

   f. $\left(8x^{-6}\right)\left(-15x^{-14}\right)$

   g. $\frac{x^9}{x^{-9}}$

   h. $\frac{-88x^{10}}{-8x^3}$

   i. $\frac{35x^0}{25x^{-5}}$

   j. $\left(\frac{x^{-8}}{x^{-9}}\right)^2$

   k. $\left(\frac{-35x^7}{-7x^2}\right)^3$

   l. $\left(\frac{40x^{-8}}{-8x^{-2}}\right)^{-3}$

3. Solve.

   a. $2^x = \frac{1}{32}$

   b. $125^x = 25$

   c. $3^x = \frac{1}{81}$

   d. $\left(\frac{1}{2}\right)^x = 128$

   e. $\left(\frac{4}{9}\right)^x = \frac{81}{16}$

   f. $\left(\frac{1}{8}\right)^x = \frac{1}{16}$

4. Solve each equation. If answers are not exact, approximate them to two decimal places.

   a. $x^5 = 895$

   b. $x^{0.8} = 45$

   c. $x^{-3} = 1234$

   d. $6x^{1.5} = 80$

   e. $20x^{1/2} - 8 = 4.5$

   f. $5x^{-1/3} = 0.06$

   g. $8x^9 = 6x^6$

   h. $15x^{-3} = 10x^{-2}$

   i. $200x^{-1} = 125x^{-3}$

' Lesson 5.2 - Properties of Exponents and Powér Functions

. Name u . . __Périoc_i l Date

1. Rewrite each efcpression as a fraction without exponents. Verify that your answer is equivalent to the original expression using your

2. Rewrite each expression in the form x" or ax".

Lesson 5.3 • Rational Exponents and Roots

Name _____ Period _____ Date _____

1. Identify each function as a power function, an exponential function, or neither of these. (It may be translated, stretched, or reflected.)

   a. $f(x) = 2^x$

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

   c. $f(x) = 0.5x^3 - 4$

   d. $f(x) = \frac{1}{3^x}$

   e. $f(x) = \frac{1}{x} + 2$

   f. $f(x) = \frac{1}{2x^2 - x}$

2. Rewrite each expression in the form b^x in which x is a rational exponent.

   a. $\sqrt[4]{b}$

   b. $\sqrt{c^3}$

   c. $\sqrt[5]{d^7}$

   d. $\frac{1}{\sqrt[3]{a}}$

   e. $\left(\sqrt[3]{d}\right)^4$

   f. $\frac{1}{\sqrt{r^5}}$

3. Solve each equation. If answers are not exact, approximate them to the nearest hundredth.

   a. $\sqrt[5]{x} = 12$

   b. $\sqrt[3]{x^2} = 5.5$

   c. $\sqrt[5]{x^3} = 27$

   d. $\frac{1}{\sqrt{x}} = 0.77$

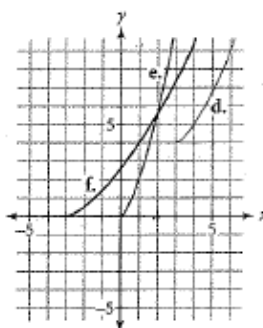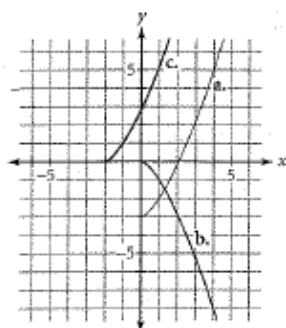   e. $\sqrt{8x^3} = 20$

   f. $4\sqrt[3]{x} + 18 = 32$

   g. $\sqrt[5]{x^3} - 23 = -15$

   h. $\sqrt[3]{4x^2} + 8.5 = 19.8$

   i. $\sqrt[8]{x^5} = 12.75$

4. Each of the following graphs is a transformation of the power function $y = x^{3/2}$. Write the equation for each curve.

1. Identify each Tunction as a power function, an exponential function, or neither of these. (It may be 'translated, stretched, or reflected.)

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