**7-3 Practice**

***Logarithms and Logarithmic Functions***

**Write each equation in exponential form.**

 **1.** $log\_{6}$ 216 = 3 **2.** $log\_{2}$ 64 = 6 **3.** $log\_{3}$ $\frac{1}{81}$ = –4

 **4.** $log\_{10}$ 0.00001 = –5 **5.** $log\_{25}$ 5 = $\frac{1}{2}$ **6.** $log\_{32}$ 8 = $\frac{3}{5}$

**Write each equation in logarithmic form.**

 **7.** $5^{3}$ = 125 **8.** $7^{0}$ = 1 **9.** $3^{4}$ = 81

**10.** $3^{-4}$ = $\frac{1}{81}$ **11.** $\left(\frac{1}{4}\right)^{3}$ = $\frac{1}{64}$ **12.** $7776^{\frac{1}{5}}$ = 6

**Evaluate each expression.**

**13.** $log\_{3}$ 81 **14.** $log\_{10}$ 0.0001 **15.** $log\_{2}$ $\frac{1}{16}$ **16.** $log\_{\frac{1}{3}}$ 27

**17.** $log\_{9}$ 1 **18.** $log\_{8}$ 4 **19.** $log\_{7}$ $\frac{1}{49}$ **20.** $log\_{6}$ $6^{4}$

**Graph each function.**

**21.** *f*(*x*) = $log\_{2}$ (*x* – 2) **22.** *f*(*x*) = –2 $log\_{4}$ *x*



**23. SOUND** An equation for loudness, in decibels, is *L* = 10 $log\_{10}$ *R*, where *R* is the relative intensity of the sound. Sounds that reach levels of 120 decibels or more are painful to humans. What is the relative intensity of 120 decibels?

**24. INVESTING** Maria invests $1000 in a savings account that pays 4% interest compounded annually. The value of the account *A* at the end of five years can be determined from the equation $log\_{10}$ *A* = $log\_{10}$ [1000$(1 + 0.04)^{5}$]. Write this equation in exponential form.

**7-3 Word Problem Practice**

***Logarithms and Logarithmic Functions***

**1. CHEMISTRY** The pH of a solution is found by the formula pH = – log *H*, where *H* stands for the hydrogen ion concentration in the formula. What is the pH of a solution to the nearest hundredth when
*H* is 1356?

**2. FIND THE ERROR** Michio wanted to find the value of *x* in the equation $2(3)^{x}$= 34. He first converted the equation to $log\_{3}$ 2*x* = 17. Next he wrote 2*x* = $3^{17}$ and used a calculator to find *x* = 64,570,081. Was his answer correct? If not, what was his mistake and what is the right answer?

**3. SOUND** The decibel level *L* of a sound is determined by the formula *L* = 10 $log\_{10}$ $\frac{I}{M}$. Find *I* in terms of *M* for a noise with a decibel level of 120.

**4. EARTHQUAKES** The intensity of an earthquake can be measured on the Richter scale using the formula
*y* = $10^{R - 1}$, where *y* is the absolute intensity of the earthquake and *R* is its Richter scale measurement.

|  |  |
| --- | --- |
| **Richter Scale Number** | **Absolute Intensity** |
| 1 | 1 |
| 2 | 10 |
| 3 | 100 |
| 4 | 1000 |
| 5 | 10,000 |

 An earthquake in San Francisco in 1906 had an absolute intensity of 6,000,000. What was that earthquake’s measurement on the Richter scale?

**5. GAMES** Julio and Natalia decided to play a game in which they each selected a logarithmic function and compare their functions to see which gave larger values. Julio selected the function *f* (*x*) = 10 $log\_{2}$ *x* and Natalia selected the function 2 $log\_{10}$ *x*.

 **a.** Which of the functions has a larger value when

 *x* = 7?

 **b.** Which of their functions has a larger value when

 *x* = 1?

 **c.** Do you think the base or the multiplier is more important in determining the value of a logarithmic function?