

## Chapter 7 Review

BLM 7-10

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**7.1 Equivalent Forms of Exponential Equations**

1. Write each as a power of 8.

a) 512

b)  $\frac{1}{64}$

c)  $\sqrt[3]{32}$

2. Write each as a power of 8, correct to three decimal places.

a) 20

b) 4.5

3. Solve.

a)  $4^{2x+5} = 32^{4-x}$

b)  $27^{2-3x} = \left(\frac{1}{9}\right)^{2x}$

**7.2 Techniques for Solving Exponential Equations**

4. Solve exactly.

$4^{2x-5} = 7^x$

5. Solve. Round answers to two decimal places.

$5^{p+4} = 2^{4-5p}$

6. A 30-mg sample of a radioactive isotope decays to 27 mg in 12.5 h.

a) Calculate its half-life, to two decimal places.

b) How long will it take (to the nearest hour) until only 5 mg of the sample remain?

7. Solve. Check for extraneous roots.

a)  $3^{2x} - 4(3)^x + 3 = 0$

b)  $2^x = 2 + 3(2)^{-x}$

8. The growth of an ant hill population is

modelled by the equation  $P = 500(2)^{\frac{t}{D}}$ , where  $P$  is the population at any time  $t$ , in months, and  $D$  is the amount of time needed for the population to double, in months. If the population of the ant hill is 1200 after 2 months,

a) calculate the doubling time, to two decimal places

b) determine how long it will take for the population to reach 10 000

**7.3 Product and Quotient Laws of Logarithms**

9. Evaluate, using the laws of logarithms.

a)  $\log_4 12 - \log_4 3$

b)  $3\log 6 + 2\log 5 - \log 54$

10. Write
- $\log_3 5 + 2\log_3(x-2)$
- as a single logarithm.

11. Write
- $\log\left(\frac{ab^4}{\sqrt[4]{c}}\right)$
- as sums and

differences of logarithms. Simplify, if possible.

12. Simplify and state restrictions necessary on the variable.

a)  $\log(x^2 - 4x - 12) - \log(3x - 18)$

b)  $\log(x^3 - 27) - \log(x - 3)$

**7.4 Techniques for Solving Logarithmic Equations**

13. Solve. Check for extraneous roots.

a)  $\log_3(3x+7) = 2$

b)  $\log_5(2x+1) = 1 - \log_5(x+2)$

14. Solve  $\log_4(3x-1) + \log_4(x+5) = 2$ .

Round your answers to two decimal places. Check for extraneous roots.

15. The time it takes an oven to preheat is given by the formula  $t = \frac{3\log(0.1T-2)}{\log 2}$ ,

where  $t$  is the time, in minutes, and  $T$  is the temperature, in degrees Celsius, at which the oven is set at.

- a) How long will it take to preheat an oven to  $350^\circ\text{C}$ ?
- b) If it takes 16 min to preheat the oven, what was the temperature setting for the oven?

### 7.5 Making Connections: Mathematical Modelling With Exponential and Logarithmic Equations

16. The population of a species of animal in a nature reserve grows by 12.2% each year. Initially, there are 200 of that species.

- a) Write an equation for the population of the species as a function of time, in years.
- b) What will the population be after 20 years?
- c) How long does it take the population to double?
- d) After 20 years, an epidemic kills all but 200 of the species. After the epidemic, the population grows as it did before. What will be the equation modelling the population after the epidemic?
- e) Sketch the graph of the population for  $0 \leq t \leq 30$ .