

Math B30 Exponential and Logarithmic Function Review

Name: _____

1. Solve the following exponential equations. (15.5 marks)

a) $9^{2x} = \sqrt{27}$

b) $\left(\frac{1}{8}\right)^{x+2} = \left(\frac{1}{32}\right)^{x-1}$

c) $25\left(\frac{1}{5}\right)^{x-1} = 125^{x+2}$

d) $2\sqrt[3]{4} = \left(\frac{1}{32}\right)^x$

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

f) $5^{x^2} - 25 = 600$

2. Determine the value of each of the following logarithms being sure to show all work. (6marks)

a) $\log_{\sqrt{4}} 64$

b) $\log_2 \left(\frac{125}{8}\right)$

c) $\log_{\frac{1}{2}} 16$

d) $\log_3 \sqrt[4]{27}$

3. Determine the value of x in each of the following logarithmic equations. (6 marks)

a) $\log_x 16 = \frac{2}{3}$

b) $\log_x \left(\frac{1}{81}\right) = -4$

c) $\log_8 x = \frac{2}{3}$

c) $\log_{32} x = -\frac{2}{5}$

4. Use a scientific calculator to find the value of x to 3 decimal places. (1.5 marks)

a) $\log 54 = x$

b) $\log x = -1.2$

5. The Richter scale rating, R , is given by the function shown at the right. In this formula, I is the wave energy of an earthquake per unit of area and I_0 is the smallest detectable intensity.

$$R = \log \left(\frac{I}{I_0} \right)$$

Find the Richter scale rating of an earthquake whose intensity is 12,000 times more intense than the smallest detectable intensity. (2 marks)

6. Solve the following logarithmic equations. (10 marks)

a) $\log_3 x + 2\log_3 2 = \log_3 12$

b) $3\log_3 x + 2\log_3 3 = 2\log_3 6 + \log_3 2$

c) $\log_3 12 = 2\log_3 x + 1$

d) $3 - \log_3 x = \log_3 (x + 6)$

7. Solve the following exponential equations. Express solutions to four decimal places. (11 marks)

a) $3^{2x} = 36$

b) $9.3^{x+1} = 0.4$

c) $2^{x-3} = 7^x$

d) $3^{2x} = 30^{x-1}$

8. Use the compound interest formula, $A = A_0(1+i)^t$, to solve the following problems. (6.5 marks)

a) Upon her birth, Justine's parents invested \$1000 in an account earning 8% interest compounded annually. If her parents turn the account over to her on her 18th birthday, how much money will she have in the account?

b) In five years, Mathew estimated that he will need about \$10 000 to cover the cost of his first year of university. How much money would he need to invest now at 7% compounded annually to achieve his objective?

c) On your thirteenth birthday, you receive a \$100 gift from your grandparents. If you invest the money at 9% compounded annually, how long will it take for your investment to accumulate to \$500?

9. Use the exponential growth formula, $N = N_0 (2)^{\frac{t}{d}}$, to solve the following problems. (5.5 marks)
- a) Certain plant cells double every 40 minutes under controlled conditions. If there are 700 cells initially, how many will there be in 9 hours?

- b) There are 50 bacteria present initially in a culture. In 60 minutes, the count is 204 800 bacteria. What is the doubling period?

10. Use the exponential decay formula, $M = M_0 (2)^{-\frac{t}{h}}$, to solve the following problems. (6 marks)

- a) If the half-life of a radioactive substance, Bismuth 210, is 5 days, how long will it take for a sample to decay to $\frac{1}{\sqrt{32}}$ of its original mass?

- b) During an excavation, the remains of a human skeleton were discovered. After analyzing the bones, the amount of carbon 14 remaining was determined to be $\frac{24}{25}$ of its original amount. Knowing that the half life of carbon 14 is 5760 years, how old were the skeletal remains?