Math 110 – Chapter 4 – Worksheet 2 – Version A

Exponential and Logarithmic Equations and Inequalities; Logarithmic Scales

Section 4.4 Exponential and Logarithmic Equations and Inequalities

1. Solve each equation.
   a) $3^x = 243$
   b) $8^x = 4$
2. Solve the equation: $7 \cdot 3^{x+1} = 11$
3. Solve the equation: $3^{x+1} = 2^{2x}$
4. Solve the equation: $e^{2x} - 4e^x - 5 = 0$.
5. The population in the U.S. in 2010 was 308 million and its annual rate of growth was 1.1%. The population of Pakistan in 2010 was 185 million and its annual rate of growth was 3.3%.
6. Estimate the population of each country in 2020.
7. In which year will the population of the U.S be 350 million?
8. In which year will the population of Pakistan be the same as the population of the U.S.?
9. Solve and check: $1 + 2\ln x = 4$.
10. Solve and check: $\log_3(x-2) + \log_3 x = 2$
11. Solve: $\ln(x+5) + \ln(x+1) = \ln(x-1)$.
12. Suppose the carrying capacity M of the human population on Earth is 35 billion. In 1987 the world population was about 5 billion. Use the logistic growth model of P. F. Verhulst to calculate the average rate, k, of growth of the population given that the population was about 6.5 billion in 2005.
13. Solve the inequality: $3 \cdot (0.5)^x + 7 > 19$
14. Solve the inequality: $\ln(1-3x) > 2$

Section 4.5 Logarithmic Scales

15. The $[H^+]$ of a solution is 2.68×10^{-5}. Find its pH value.
16. Find $[H^+]$ of seawater if its pH is 8.47.
17. How much more acidic is the acid rain with a pH value of 2.8 than an ordinary rain with a pH value of 6.2?
18. The magnitude of an earthquake is 6.5 on the Richter scale. What is the intensity of this earthquake?
19. The magnitudes of earthquakes in Mozambique (2006) and Southern California (2005) were 7.0 and 5.2 respectively. Compare their intensities.
20. Find the decibel level of a TV that has intensity $200 \times 10^{-7}\ W/m^2$.
21. How much more intense is a 75dB sound than a 55-dB sound?
22. What is the intensity of a 48-dB sound?
23. Compare the brightness of a magnitude 0 star with that of a magnitude 2 star.
24. Find the magnitude of a star that is 50% brighter than a star of magnitude 4.6.