Week in Review # 7

MATH 150

4.2 through 4.5 Drost-Fall 2004

1. Solve: $\left(\frac{1}{9}\right)^{x+1} = 27$

2. Find the domain:
   a. $f(x) = \sqrt{2^x + 1}$
   b. $g(x) = \dfrac{x-2}{3^x - 1}$
   c. $h(x) = \sqrt{3^x - 81}$

3. Solve: $2^x - 4\,(2^{-x}) = 3$

4. The population of Centerville is growing according to the formula $P(t) = P_o \cdot 2^{0.03\,t}$ where P_o is the population in a certain year and P is the population after t years. Suppose the population in 1995 is 32,000.
   a. What is the population in 1998?
   b. What is the population in 1999?
   c. What is the ratio of your answers to parts a and b?

5. An animal control unit estimates the stray cat population in a certain town is 130, and the future population is approximated by the function:
   $$n(t) = \frac{520}{1 + 3e^{-0.42\,t}}$$
   where n is the number of stray cats in t years.

a) How many stray cats will there be in 10 years?

b) Approximately how many years will it take for there to be 400 stray cats?

6. Simplify:
   a) $\log_5 \sqrt[3]{25}$
   b) $\log_{\frac{1}{2}} 8$
   c) $\log_3(\log_8 2)$
   d) $\log_x 36 = 2$, Solve for x.

7. Given: $\log_b 3 = -2$ and $\log_b 5 = 4$
   a) find $\log_b 45$
   b) find $\log_b 125$
   c) find $\log_b (3 + 5)$

8. Write as a single logarithm:
   $4\log_b x - 2\log_b y + \frac{1}{2}\log_b z + 1$

9. Solve: $\log 8 + \log x + \log x^2 = 3$

10. Evaluate: $4^{2\log_4 3}$

11. Graph: $y = \log(2x + 5)$

12. Describe the graph of $f(x) = \ln(ex)$

13. Evaluate: (round answer to 2 decimal places)
    $\log_5 72$

14. If \$3,000 is invested at $7\frac{1}{2}\%$ compounded weekly, what is the balance in 5 years, assuming no withdrawals?

15. How long will it take an investment to double at $6\frac{3}{4}\%$ compounded monthly?

16. What is the effective yield of $6\frac{1}{4}\%$ compounded daily?

17. If Bank A offers $7\frac{1}{4}\%$ compounded semi-annually, and Bank B offers 7.2% compounded continuously, in which bank would an investment of \$10,000 earn the most money if left 7 years? How much more?

18. It is estimated that the world's population was 5.8 billion in 1996. Assuming a growth rate of 1.5%, what will the population be in the year 2030?

19. Solve: $\log_2(\log_3(\log_5(x+1))) = 0$

20. Solve: $\log_3(2 - x) = 4$

21. Solve: $2\log x = \log 2 + \log(3x - 4)$

22. T or F: An exponential equation is an equation with an exponent.

23. T or F: The domain of $f(x) = \ln x$ is all non-negatives.

24. Solve: $e^x - 12e^{-x} - 1 = 0$

25. Solve: $x^2 10^x - x10^x = 2 \cdot 10^x$

26. A small lake is stocked with a certain type of fish whose population is modeled by the function $P = \dfrac{10}{1 + 4e^{-0.8t}}$ where P is the number of fish in thousands and t is measured in years since 1980.
    a. Find the fish population in 1984.
    b. Find the initial population of fish.
    c. What year will the fish population reach 8000 fish?

Answers:

1. $x = -2.5$

2a) $\Re$

2b) $\Re, x \neq 0$

2c) $\Re, x \geq 4$

3. $x = 2$

4a) $32,000 \cdot 2^{0.09} \approx 34,060$ people

4b) $32,000 \cdot 2^{0.12} \approx 34,776$ people

4c) $2^{.03}$

5a) 498

5b) 5.5 years

6a) $\frac{2}{3}$

6b) -3

6c) -1

6d) 6

7a) 0

7b) 12

7c) cannot be determined

8. $\log_b \dfrac{x^4\sqrt{z}}{y^2} + 1$

9. 5

10. 9

11.

12. rigid transformation of $y = \ln\ x$ shifted up 1

13. 2.66

14. $\$4,363.80$

15.≈ 10.3years

16. 6.45%

17a) Bank B

17b) \$90.49

18. 9.62 billion people

19. 124

20. -79

21. $x = 4, 2$

22. false

23. false

24. $x = \ln 4$

25. $x = 2, -1$

26a. $\approx$ 8600 fish

26b. 2000 fish

26c. 1983