Pre-Calculus A
Chapter 3 Review

Name : _____
Date : _____ Period : _____

Convert each exponential equation to logarithmic form.

1. $4^5 = 1024$
2. $e^{2.708} = 15$

Convert each logarithmic equation to exponential form.

3. $\log_7 \frac{1}{49} = -2$
4. $\log 0.0001 = -4$
5. $\ln 5 = 1.6094$

Find the value of each logarithmic expression.

6. $\log 10$
7. $\log_6 \sqrt{6}$
8. $\log_4 \left(\frac{1}{16}\right)$
9. $\log_{64} 2$
10. $\ln(1)$

Approximate the value of each logarithm using the Change of Base Formula.

11. $\log_7 156$
12. $\log_4 0.0376$

Use $\log_b 2 \approx 0.3868$, $\log_b 3 \approx 0.6131$ and $\log_b 7 \approx 1.086$ to approximate the value of the expression.

13. $\log_b 18$
14. $\log_b 4\sqrt{7}$

Expand each logarithmic expression.

15. $\ln\left(\frac{8}{6x}\right)$

16. $\log_7\left(\frac{6x^2y}{t^3z}\right)$

17. $\log_3\left(\frac{3\sqrt{x}}{y^2}\right)$

18. $\ln(16x^2\sqrt[5]{y^2z^3})$

Condense each logarithmic expression.

19. $\log_3 5+\log_3 7+\frac{1}{2}\log_3 36$

20. $3(\log_2 24-\log_2 8)$

21. $3\ln x+0.5(\ln 36-2\ln 2)$

22. $\frac{1}{3}\log_4 x-\left(2\log_4 y+\frac{1}{2}\log_4 z\right)$

Solve each equation. Round solutions to 4 decimal places. Be sure to check for extraneous solutions.

23. $16^{4x-2} = \left(\frac{1}{64}\right)^{2x-1}$

24. $3(4^{3x+5}) - 2 = 17$

25. $4^{x+2} - 5 = 3$

26. $\frac{10}{1+e^{-x}} = 2$

27. $e^{x-6} = 14$

28. $\log(x) = 1 - \log(x-3)$

29. $2 + 3\log_2(5x-1) = 20$

30. $2\ln(3x+2) = 14$

31. $3\left(\log_6(4x+1)\right) + 2 = 11$

32. $\log_6 3 + \log_6 x = 2$

33. $\log_4(2x+1) = \log_4(x+2) - \log_4 3$

34. $e^{-2x^2} = e^{-x^2+4x-12}$

35. Find the amount of time (in years) that it would take for a deposit of $1,000 to grow to $1 million at 14% compounded continuously. Round to the nearest tenth of a year.

36. At what interest rate would a deposit of $30,000 grow to $2,540,689 in 40 years compounded continuously? Round to the nearest tenth.

37. The projected population of California for the years 2015 to 2030 can be modeled by the function $P = 34.706e^{0.0097t}$, where *P* is the population (in millions) and *t* is the time (in years), with t = 15 corresponding to 2015. Determine in which year the population of California will exceed 50 million.

38. The speed of the wind *S* (in miles per hour) near the center of a tornado and the distance d (in miles) the tornado travels are related by the model $S = 93\log d + 65$. On March 18, 1925, a large tornado struck portions of Missouri, Illinois, and Indiana with a wind speed at the center of about 283 miles per hour. Approximate the distance traveled by this tornado to the nearest tenth.

39. How long will it take a sample of radioactive substance to decay to half of its of its original amount, if it decays according to the function $A(t) = 500e^{-0.000436t}$ where t is the time in years? Round to the nearest hundredth.

40. The population of Phoenix, Arizona has grown exponentially since 1950 according to the equation $P = P_0 e^{kt}$. In 1950 (t = 0), the population was 100,000 and in 1970 (t = 20) it was 500,000.

    a) How many people lived in Phoenix in 1980 (t = 30) ?

    b) During what year will the population of Phoenix reach 5,000,000 assuming growth continues exponentially?

Answer Key :

1) $\log_4 1024 = 5$
2) $\ln 15 = 2.708$
3) $7^{-2} = \frac{1}{49}$
4) $10^{-4} = 0.001$
5) $e^{1.6094} = 5$
6) 1
7) $\frac{1}{2}$
8) -2
9) $\frac{1}{6}$
10) 0
11) 2.5951
12) -2.3666
13) 1.613
14) 1.3166
15) $\ln 8 - (\ln 6 + \ln x)$
16) $\log_7 6 + 2\log_7 x + \log_7 y - (3\log_7 t + \log_7 z)$
17) $1 + \frac{1}{2}\log_3 x - 2\log_3 y$
18) $\ln 16 + 2\ln x + \frac{2}{5}\ln y + \frac{3}{5}\ln z$
19) $\log_3 210$
20) $\log_2 27$
21) $\ln 3x^3$
22) $\log_4 \frac{\sqrt[3]{x}}{y^2\sqrt{z}}$
23) $x = \frac{1}{2}$
24) $x \approx 0.1105$
25) $x = -\frac{1}{2}$
26) $x \approx -1.3863$
27) $x \approx 8.6391$
28) $x = 5$
29) $x = 13$
30) $x \approx 364.8777$
31) $x = 53.75$
32) $x = 12$
33) $x = -\frac{1}{5}$
34) $x = -6,\ x = 2$
35) 49.3 years
36) 11.1%
37) 2037
38) 220.8 miles
39) 1589.79 years
40) a. 1,118,033 people b. 1998