Review

SM3 Test Review Unit 11

Name _____ Date _____ Period Key

Evaluate the logarithm without a calculator. Show work!

1. $\log_6\left(\frac{1}{36}\right)$ $\log_6 \frac{1}{6^2}$ $\log_6 6^{-2} = -2$

2. $10^{\log 5}$ 5

3. $\log 1000$ $\log_{10} 10^3 = 3$

4. $\log_{21}\sqrt{21}$ $\log_{21} 21^{1/2} = 1/2$

5. $\ln \frac{1}{\sqrt{e}}$ $\ln_e \frac{1}{e^{1/2}}$ $\ln_e e^{-1/2} = -1/2$

6. $\log_7 343$ $\log_7 7^3$ 3

7. $\log_6 6^2$ 2

8. $e^{\ln 20}$ 20

9. $\log_8 \frac{1}{64}$ $\log_8 \frac{1}{8^2} = \log_8 8^{-2}$ -2

10. $\ln e^1$ $\ln_e$ 1

11. $\log_{12} 1 =$ 0

Find the following using a calculator. Round to the nearest ten thousandths.

12. $\log 32$ 1.5051

13. $\ln 0.98$ $-.0202$

14. $\log(-3)$ ← negative; no solution

15. $5^{3.2}$ 172.4662

Rewrite as an exponential function.

16. $\log x = 4$ (base 10) $10^4 = x$

17. $\ln 5 = x$ (base e) $e^x = 5$

18. $\log_3 243 = 5$ $3^5 = 243$

Rewrite as a logarithmic function.

19. $5^4 = 625$ $\log_5 625 = 4$

20. $10^x = 100$ $\log 100 = x$

21. $e^2 = x$ $\ln x = 2$

Solve each function by making the bases the same. DO NOT use logarithms!

22. $2^{3x} = 8$

$2^{3x} = 2^3$

$3x = 3$

$x = 1$

23. $3^{2x-1} = 3^5$

$2x - 1 = 5$

$2x = 6$

$x = 3$

Rewrite the expression as a sum or difference or multiple of logarithms.

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27. $\log_2\left(\frac{5x}{y}\right)$

$\log_2 5x - \log_2 y$

$\log_2 5 + \log_2 x - \log_2 y$

25

28. $\log_8\left(\frac{2x-3}{x^4}\right)$

$\log_8 (2x-3) - \log_8 x^4$

$\log_8 (2x-3) - 4\log_8 x$

Use the product, quotient and power rules of logarithms to rewrite the expression as a single logarithm. Assume that all variables represent positive real numbers.

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29. $\log_3 6 - \log_3 a$

$\log_3\left(\frac{6}{a}\right)$

27

30. $4\log x + 2\log y$

$\log(x^4 y^2)$

28

31. $2\log_4 3 + \log_4(x-5) - 7\log_4 x$

$\log_4 \frac{3^2(x-5)}{x^7} = \log_4\left(\frac{9x-45}{x^7}\right)$

Write the change of base rule to find the logarithm to the nearest ten thousandths.

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32. $\log_{3.4} 210$

$\frac{\log 210}{\log 3.4}$

4.3694

30

33. $\log_4 3.8$

$\frac{\log 3.8}{\log 4}$

$.9630$

Solve each equation. Show work. Round to the nearest thousandths if necessary.

31. ~~36.~~ $\log_4 x = \frac{1}{2}$

$4^{1/2} = x$

$\sqrt{4} = x$

$2 = x$

32. $\log_5 (x-4) - \log_5 5 = 2$

$\log_5 \left(\frac{x-4}{5}\right) = 2$

$5^2 = \frac{x-4}{5}$

$\frac{25}{1} = \frac{x-4}{5}$

$125 = x-4$

$\boxed{129 = x}$

33. ~~38.~~ $\log_2(x+2) = 5$

$2^5 = x+2$

$32 = x+2$

$30 = x$

34. $\log_4(4x) + \log_4(x) = 4$

$\log_4(4x \cdot x) = 4$

$4^4 = 4x^2$

$256 = 4x^2$

$\sqrt{64} = \sqrt{x^2}$

$8, -8 = x$

$\boxed{x = 8}$

35. ~~40.~~ $-10^{x-2} + 8 = -20$

$-10^{x-2} = -28$

$10^{x-2} = 28$

$\log 28 = x-2$

$2 + \log 28 = x$

$x = 3.447$

36. ~~41.~~ $\log_5 4x = \log_5 10$

$4x = 10$

$x = \frac{10}{4} = \boxed{\frac{5}{2}}$

37. $5^{x-10} = 9$

$\log_5(9) = x - 10$

$+10 \quad +10$

$\boxed{x = \log_5(9) + 10}$

38. $5 \cdot 3^{2-x} - 6 = 34$

$5 \cdot 3^{2-x} = 40$

$3^{2-x} = 8$

$\log_3(8) = 2 - x$

$\log_3(8) - 2 = -x$

$\boxed{-\log_3(8) + 2 = x}$

39. $e^{x-3} = 29$

$\ln(29) = x - 3$

$\boxed{\ln(29) + 3 = x}$

40. $A = 15000e^{.0475 \cdot 5}$

$\boxed{A = \$19021.12}$

41. $A = 10000\left(1 + \frac{.10}{4}\right)^{\frac{12}{5} \cdot 4}$

$\boxed{A = \$13448.89}$

42. Compounded Daily

$A = 5000\left(1 + \frac{.073}{365}\right)^{365 \cdot 2}$

$\boxed{A = \$5785.90}$

Compounded Continuously

$A = 5000e^{.073 \cdot 2}$

$\boxed{\$A = 5785.98}$

$\boxed{\text{Compounded Continuously would give the higher result.}}$

43. $P(t) = 500000e^{.08t}$

$\boxed{A_0 = 500{,}000 \text{ people}}$

44. $P(t) = 5000{,}000e^{.08t}$

$\boxed{\text{Growth; Rate is } 8\%}$

45. $P(10) = 500000e^{.08 \cdot 10}$

$\boxed{1{,}112{,}771 \text{ people approximately}}$ Round up with people

46. $1{,}000{,}000 = 500{,}000e^{.08t}$

$2 = e^{.08t}$

$\frac{\ln 2}{.08} = \frac{.08t}{.08}$

$t = \frac{\ln(2)}{.08} \approx$ $\boxed{8.7 \text{ years}}$