Logarithms Review #1 Name____________________ Date__________ Period______

DO PROBLEMS IN YOUR NOTEBOOK

Part 1: Change Forms

Write each equation in ***exponential*** form. **(NO Calculator)**

1. $\log_2 64 = 6$ 2. $\log_4 \frac{1}{64} = -3$ 3. $\log_{10}(0.01) = -2$ 4. $\log_5 125 = 3$

Write each equation in ***logarithmic*** form. **(NO Calculator)**

5. $2^5 = 32$ 6. $5^{-1/2} = \frac{\sqrt{5}}{5}$ 7. $10^{-1} = 0.1$ 8. $3^3 = 27$

Part 2: Mental Math *Evaluate* the expression. Answer can be in terms of e. Hint for 1-12—set = x and solve for x. **(NO Calculator)**

1. $\log_2 8$ 2. $\log_8 64$ 3. $\log_6 216$ 4. $\log_7 7$

5. $\log_6 1$ 6. $\log_8 \frac{1}{8}$ 7. $\log_7 \frac{1}{49}$ 8. $\log_9 \frac{1}{27}$

9. $\log_5 \sqrt{5}$ 10. $\log_9 3$ 11. $\log_2 \sqrt[3]{2}$ 12. $\log_{1/2} 16$

13. $\ln e^{(x+2)} = 5$ 14. $\ln e^{3x} = 21$ 15. $e^{\ln(x-3)} = 9$ 16. $e^{\ln(x+7)} = 19$

Use a calculator to evaluate each expression. *Plug it in and round to three decimal places*. **(Calculator)**

17. e^3 18. $5e^{\frac{3}{4}}$ 19. $\ln 1.6$ 20. $4\ln 6 + 7$ 21. $5\ln 7 - \ln 8$

Part 3: Expand the expression using the properties of logs. The words log/ln will be used ***repeatedly*** in each problem. **(NO Calculator)**

1. $\log_6 3x$ 2. $\log_2 \frac{x}{5}$ 3. $\log_{10} xy^2$

4. $\log_4 \frac{xy}{3}$ 5. $\log_5 2\sqrt{x}$ 6. $\log_m \frac{a}{yw}$

7. $\ln x^{1/2}yz$ 8. $\ln 5x^3$ 9. $\ln\left(\frac{x}{y}\right)$

Part 4: Condense the expression using the properties of logs. The word log/ln will be used ***once*** in each problem. **(NO Calculator)**

1. $\log_3 8 - \log_3 2$ 2. $2\log_5 4 + \log_5 3$ 3. $\log_4 5 + \log_4 3 + \log_4 1$

4. $\frac{1}{2}\log_{10} 24 - \log_{10} 4$ 5. $\frac{2}{3}\log_2 x - 3\log_2 y$ 6. $\log_3 4 + 2\log_3 x - \log_3 5$

7. $\frac{1}{2}\log_2 x - 2\log_s y$ 8. $3\log_a 2 + \frac{1}{3}\log_a 27 - \frac{1}{2}\log_a 16$ 9. $\ln x + \ln 5$

10. $\ln 4 - \ln y$ 11. $4\ln x + 5\ln y$ 12. $\ln 6 - (\ln x + \ln 3)$ 13. $\ln 4 + 3\ln x + ½\ln y$

Part 5: Solve for x. **(NO Calculator)**

1. $\log_6 x = 2$ 2. $\log_5 x = 3$ 3. $\log_{16} x = \frac{1}{2}$ 4. $\log_9 x = \frac{3}{2}$

5. $\log_2 x = -1$ 6. $\log_7 x = 3$ 7. $\log_4 4^{(x+2)} = 5$ 8. $\log_3 x = 4$

Part 6: Solve for x. Round to 3 decimal places if necessary. Be sure to get the exponent by itself! **(Calculator)**

1. $\log_3 5 = x$
2. $\log_6 50 = x$
3. $\log_3 15 = x$
4. $10^x = 200$
5. $7^x = 300$
6. $5^{x-6} = 100$
7. $16 - 4^x = 10$
8. $5^x = 12$
9. $5^{x+2} = 500$
10. $2^x = 1{,}000{,}000$
11. $\dfrac{4^x}{2} = 20$
12. $5(1.5)^x = 3000$
13. $8^{x-4} = 75$
14. $48 - 2^x = 40$
15. $6(1.2)^x = 18$
16. $27^{2x-1} = 3$

18. $8^{x+2} = 2$
19. $4^{1-x} = 8$
20. $3^x = 27$
21. $4^x = 8^5$

Part 7: Condense & Solve Condense the each side of the equation, **then** solve for x. If there is a log with the same base on both sides then they cancel. **(NO Calculator)**

1. $\log_5 x = 3\log_5 2$
2. $\log_4 x = \log_4 15 - \log_4 3$
3. $\log_a x = 2\log_a 3 + \log_a 5$
4. $\log_a x = \frac{3}{2}\log_a 9 + \log_a 2$
5. $\log_b(x+3) = \log_b 8 - \log_b 2$
6. $\log_b(x^2+7) = \frac{2}{3}\log_b 64$
7. $\log_x 100 - \log_x 4 = 2$
8. $\log_x 12 + \log_x 3 = 2$
9. $\log x - \log(x+3) = \log 1 - \log 10$
10. $\log(x+9) - \log x = \log 10$
11. $2\log_4 3 = \log_4 x$
12. $\log_{10} x + \log_{10} 3 = \log_{10} 12$
13. $\log_3 5 - \log_3 x = \log_3 2$
14. $\frac{1}{2}\log_3 16 = \log_3 x$
15. $\frac{1}{3}\log_{10} x = \log_{10} 3$
16. $3\log_5 2 + \log_5 x = \log_5 24$
17. $\ln x = 2\ln 3$
18. $\ln x = 2\ln 3 + \ln 7$
19. $\ln(x+3) = \ln 20 - \ln 2$
20. $\ln(x^2+7) = \frac{2}{3}\ln 64$

Part 8: u-substitution Factor the following and solve. (Round answers to three decimal places)

21) $e^{2x} - 4e^x - 4 = 0$
22) $e^{2x} - 5e^x + 6 = 0$
23) $e^{2x} - 3e^x - 4 = 0$

Part 9: Applications Write the equation and solve each problem. **(Calculator)**

1. The population of bacteria can be represented by the formula $N = N_o e^{kt}$, where N_o is the initial number of bacteria in the culture. N is the number after t hours, and k is a constant determined by the type of bacteria and the conditions. <u>When</u> will a culture of 300 bacteria, where k = 0.068, reach a count of 10,000?

2. A college math class consists of 32 students. On Monday at 9 AM, the teacher tells one student to notify the others that the test scheduled for Wednesday at 9 AM has been cancelled. The model for the number of students in the class who have heard this information after t hours is $N = 32 - 32e^{-0.02t}$. After <u>how many hours</u> will half of the class have been notified?

3. The power of supply of a satellite decreases exponentially over the time it is being used. The equation for determining the power supply P, in watts, after t days is $P = 50e^{-\frac{t}{250}}$. Determine the <u>number of days</u> it will take for the power supply to be less than 30W.

4. A fossil contains 47 mg of carbon-14. Using the carbon-14 formula, $A = A_0(2)^{-\frac{t}{5570}}$, determine the <u>age</u> of the fossil if it originally contained 93 mg of carbon-14.

5. Mr. Campbell invested $6500 in an account paying 6.5% interest compounded continuously. <u>How long</u> to the nearest year will it take the money in the account to increase by $1500? $A = Pe^{rt}$

6. $500 is invested at 6% annual interest, compounded quarterly. <u>When</u> will the balance double? $A = P\left(1+\dfrac{r}{n}\right)^{nt}$

7. 2000 is invested at 7% annual interest, compounded monthly. <u>When</u> will the balance triple? $A = P\left(1+\dfrac{r}{n}\right)^{nt}$

8. A population of 450 animals decreases at an annual rate of 16% per year. <u>How long</u> before there are only 100 animals left?