Student: _____ **Date:** _____	**Instructor:** Andreas Lazari **Course:** Math1111-Summer2018	**Assignment:** Section 4.3 Homework

1. Use properties of logarithms to expand the logarithmic expression as much as possible. Where possible, evaluate logarithmic expressions without using a calculator.

   $\log_8(3 \cdot 13)$

   $\log_8(3 \cdot 13) = \log_8 3 + \log_8 13$

2. Use properties of logarithms to expand the logarithmic expression as much as possible. Where possible, evaluate logarithmic expressions without using a calculator.

   $\log_2(16x)$

   $\log_2 16 = x \Rightarrow 2^x = 16 \Rightarrow 2^x = 2^4 \Rightarrow x = 4$

   $\log_2(16x) = \log_2 16 + \log_2 x = 4 + \log_2 x$

3. Use properties of logarithms to expand each logarithmic expression as much as possible. Evaluate logarithmic expressions without using a calculator if possible.

   Note: $\log_{11} 11 = 1$.

   $\log_{11}\left(\frac{11}{y}\right) = \log_{11} 11 - \log_{11} y \Rightarrow 1 - \log_{11} y$

   $\log_{11}\left(\frac{11}{y}\right) = 1 - \log_{11} y$

4. Use properties of logarithms to expand the logarithmic expression as much as possible. Evaluate logarithmic expressions without using a calculator if possible.

   $\ln\left(\frac{e^6}{3}\right) = \ln e^6 - \ln 3 = 6 - \ln 3$

   $\ln\left(\frac{e^6}{3}\right) = 6 - \ln 3$

5. Use properties of logarithms to expand the logarithmic expression as much as possible. Where possible, evaluate logarithmic expressions without using a calculator.

   $\log_d x^2 = 2 \log_d x$

   $\log_d x^2 = 2 \log_d x$

6. Use properties of logarithms to expand each logarithmic expression as much as possible. Evaluate logarithmic expressions without using a calculator if possible.

   $\ln \sqrt[8]{x} = \ln x^{1/8} = \frac{1}{8} \ln x$

   $\ln \sqrt[8]{x} = \frac{1}{8} \ln x$

7. Use properties of logarithms to expand each logarithmic expression as much as possible. Evaluate logarithmic expressions without using a calculator if possible.

$\log_b(z^4x) = \log_b z^4 + \log_b x = 4\log_b z + \log_b x$.

$\log_b(z^4x) =$ $4\log_b z + \log_b x$

8. Use properties of logarithms to expand each logarithmic expression as much as possible. Evaluate logarithmic expressions without using a calculator if possible.

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

$\log_6\left(\frac{\sqrt{x}}{36}\right) =$ $\frac{1}{2}\log_6 x - 2$

9. Use properties of logarithms to expand the logarithmic expression as much as possible. Evaluate logarithmic expressions without using a calculator if possible.

$\log_b\left(\frac{x^2y}{z^4}\right) = \log_b(x^2y) - \log_b z^4 = \log_b x^2 + \log_b y - 4\log_b z = 2\log_b x + \log_b y - 4\log_b z$

$\log_b\left(\frac{x^2y}{z^4}\right) =$ $2\log_b x + \log_b y - 4\log_b z$

10. Use properties of logarithms to condense the logarithmic expression. Write the expression as a single logarithm whose coefficient is 1. Where possible, evaluate logarithmic expressions.

$\log 4 + \log 25 = \log_{10}(4 \cdot 25) = \log_{10} 100 = \log_{10} 10^2 = 2$.

$\log 4 + \log 25 =$ 2 (Simplify your answer.)

11. Use properties of logarithms to condense the logarithmic expression. Write the expression as a single logarithm whose coefficient is 1. Where possible, evaluate logarithmic expressions.

$\log(5x+2) - \log(x) = \log_{10}\frac{5x+2}{x}$

$\log(5x+2) - \log(x) =$ _____

(Type an exact answer in simplified form. Use integers or fractions for any numbers in the expression.)

12. Use properties of logarithms to condense the logarithmic expression below. Write the expression as a single logarithm whose coefficient is 1. Where possible, evaluate logarithmic expressions.

$\frac{1}{3}\ln x + \ln y = \ln x^{1/3} + \ln y = \ln \sqrt[3]{x} + \ln y = \ln(y \cdot \sqrt[3]{x})$

$\frac{1}{3}\ln x + \ln y =$ $\ln(y \cdot \sqrt[3]{x})$

(Simplify your answer.)

13. Use properties of logarithms to condense the logarithmic expression below. Write the expression as a single logarithm whose coefficient is 1. Where possible, evaluate logarithmic expressions.

$5 \ln x - 4 \ln y$ $= \ln x^5 - \ln y^4 = \ln\left(\frac{x^5}{y^4}\right)$

$5 \ln x - 4 \ln y =$ $\ln\left(\frac{x^5}{y^4}\right)$ (Simplify your answer.)

14. Use properties of logarithms to condense the logarithmic expression. Write the expression as a single logarithm whose coefficient is 1. Evaluate logarithmic expressions if possible.

$4 \ln(x+5) - 7 \ln x$ $= \ln(x+5)^4 - \ln x^7 = \ln\left(\frac{(x+5)^4}{x^7}\right)$

$4 \ln(x+5) - 7 \ln x =$ $\ln\left(\frac{(x+5)^4}{x^7}\right)$

15. Use common logarithms or natural logarithms and a calculator to evaluate the expression.

$\log_{14} 12$ $= \frac{\ln 12}{\ln 14} = .9415887 3$

$\log_{14} 12 \approx$ 0.9416 (Round to four decimal places.)

16. Use common logarithms or natural logarithms and a calculator to evaluate the following.

$\log_{13} 87.5$ $= \frac{\ln 87.5}{\ln 13} = 1.743363$

$\log_{13} 87.5 \approx$ 1.7434

(Do not round until the final answer. Then round to four decimal places as needed.)

1. $\log_8 3 + \log_8 13$

2. $4 + \log_2 x$

3. $1 - \log_{11} y$

4. $6 - \ln 3$

5. $2\log_d x$

6. $\frac{1}{8}\ln x$

7. $4\log_b z + \log_b x$

8. $\frac{1}{2}\log_6 x - 2$

9. $2\log_b x + \log_b y - 4\log_b z$

10. 2

11. $\log \frac{5x+2}{x}$

12. $\ln\left(y\sqrt[3]{x}\right)$

13. $\ln\left(\frac{x^5}{y^4}\right)$

14. $\ln \frac{(x+5)^4}{x^7}$

15. 0.9416

16. 1.7434