Assignment 4D-2: Log Expressions & Equations

Properties of Logarithms

Let $b, R,$ and S be positive real numbers with $b \neq 1$, and c a

Product Rule: $\log_b(PQ) = \log_b P + \log_b Q$

Quotient Rule: $\log_b \frac{P}{Q} = \log_b P - \log_b Q$

Power Rule: $\log_b P^c = c \log_b P$

Where $b, R,$ and S be positive real numbers with $b \neq 1$, and c is any real number.

Change of Base: $\log_b x = \frac{\log_a x}{\log_a b}$, or more conveniently $\log_b x = \frac{\log x}{\log b} = \frac{\ln x}{\ln b}$

Assuming all the variables are positive, use the properties of logarithms to write the expression as a sum or difference of logarithms or multiples of logarithms.

1. $\log_2 y^5$
2. $\log_2 \frac{2x^3}{y^2}$
3. $\log 1000x^4$
4. $\log_3 \frac{ab}{c}$
5. $\log_6(216^x)$

Assuming $x, y,$ and z are positive, use properties of logarithms to write the expression as a single logarithm.

6. $\ln y - \ln 3$
7. $4 \log y - \log z$
8. $3 \ln 2 - 2 \ln 4$

Find the exact solution algebraically, obtain a numerical approximation, and check it by substituting into the original equation. Remember, if there is more than one logarithm, you can use the properties of logarithms to rewrite them as one logarithmic expression.

9. $\log_4(1 - x) = 1$
10. $3 \ln(x - 3) + 4 = 5$
11. $3 - \log(x + 2) = 5$
12. $\frac{1}{2}\ln(x + 3) - \ln x = 0$

13. $\log x - \frac{1}{2}\log(x+4) = 1$

14. $\ln(x-3) + \ln(x+4) = 3\ln 2$

15. $\log(x-2) + \log(x+5) = 2\log 3$

16. $\log_3(x^3) - 9 = \log_3(x)$