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What you'll Learn About

Use your Calculator to Determine which of the following are True.

1. $\log(5+2) \neq \log 5 + \log 2$

2. $\log(5 \cdot 2) = \log 5 + \log 2$

3. $\log(5-2) = \log 5 - \log 2$

4. $\log\left(\frac{5}{2}\right) = \log 5 - \log 2$

5. $\log(5 \cdot 2) = 2\log 5$

6. $\log\left(\frac{5}{2}\right) = \frac{\log 5}{\log 2}$

7. $\log(5^2) = \log 5 \cdot \log 5$

8. $\log(5^2) = 2\log 5$

9. $\ln(x+2) \neq \ln x + \ln 2$

10. $\log(7x) = 7\log x$

11. $\log(5x) = \log 5 + \log x$

12. $\ln\left(\frac{x}{5}\right) = \ln x - \ln 5$

13. $\log\left(\frac{x}{4}\right) = \frac{\log x}{\log 4}$

14. $\log_4 x^3 = 3\log_4 x$

15. $\ln(x^2) = \ln x \cdot \ln x$

16. $\log|4x| = \log 4 + \log|x|$

Let b, R, and S are positive real numbers with $b \neq 1$, and c any real number • $\log_b(RS) = \log_b R + \log_b S$ • $\log_b\left(\frac{R}{S}\right) = \log_b R - \log_b S$ • $\log_b R^c = c\log_b R$	Prove the Product Rule for Logarithms: $\log_b(RS) = \log_b R + \log_b S$ Let $x = \log_b R$ and $y = \log_b S$ $x = \log_b R$ $\quad y = \log_b S$ $b^x = R$ $\quad b^y = S$ $\log_b(RS) = \log_b b^x + \log_b b^y$ $\log_b(b^x \cdot b^y) = x + y$ $\log_b(b^{x+y}) = x + y$ $x + y = x + y$ Assuming x and y are positive, use properties of logarithms to write the expression as a **sum or difference** of logarithms or multiples of logarithms $A)\ \log(8x)$ $\log(8x) = \log 8 + \log x$ $B)\ \ln\left(\frac{5}{x}\right)$ $\ln\left(\frac{5}{x}\right) = \ln 5 - \ln x$ $C)\ \log_2(x^5) = 5\log_2 x$ $D)\ \log(8x^2y^4) = \log 8 + \log x^2 + \log y^4$ $= \log 8 + 2\log x + 4\log y$ $E)\ \ln\left(\frac{\sqrt{x^2+5}}{\sqrt[3]{x^4}}\right) = \ln\left(\frac{(x^2+5)^{1/2}}{(x^{4/3})}\right)$ $= \ln\left((x^2+5)^{1/2}\right) - \ln\left(x^{4/3}\right)$ $= \frac{1}{2}\ln(x^2+5) - \frac{4}{3}\ln x$

Let b, R, and S are positive real numbers with $b \neq 1$, and c any real number • $\log_b(RS) = \log_b R + \log_b S$ • $\log_b\left(\frac{R}{S}\right) = \log_b R - \log_b S$ • $\log_b R^c = c\log_b R$ $2 \cdot 3 \cdot 2 \cdot 3$ $(xy)^2$ $(xy)(xy)$ $x^2 \cdot y^2$	Assuming x, y and z are positive, use properties of logarithms to write the expression as a **single** logarithm $A)\ \log x + \log 6 = \log(6x)$ $B)\ \ln x - \ln 6 = \ln\left(\frac{x}{6}\right)$ $C)\ \frac{1}{4}\log x = \log x^{1/4}$ $= \log \sqrt[4]{x}$ $D)\ 6\log x - \frac{1}{2}\log y$ $\log x^6 - \log y^{1/2}$ $\log\left(\frac{x^6}{\sqrt{y}}\right)$ $E)\ 5\log(x^2y) + 3\log(y^2z)$ $\log(x^2y)^5 + \log(y^2z)^3$ $\log(x^{10}y^5) + \log(y^6z^3) = \log(x^{10}y^5 \cdot y^6z^3)$ $= \log(x^{10}y^{11}z^3)$ $F)\ \ln x^5 - 2\ln(xy)$ $\ln x^5 - \ln x^2y^2$ $\ln\left(\frac{x^5}{x^2y^2}\right) = \ln\left(\frac{x^3}{y^2}\right)$