

USING LOGARITHMIC PROPERTIES

Expand the following logarithmic expressions completely.

1. $\log(M^2 N^3)^4$

2. $\log \frac{(M^3 N^2)^3}{(M^2 N)^2}$

3. $\log \frac{(MN)^{-2}}{(M^3 N)^4}$

4. $\ln\left(\frac{7e^4}{10}\right)$

5. $\log_5(\sqrt[3]{25y})$

6. $\ln\left(\sqrt{\frac{x^2 y^3}{z^6}}\right)$

Express as a single logarithm.

7. $2\log(MN) - 3\log M + \log N$

8. $3\log(XYZ) - 2\log(XZ) - \log(YZ)$

9. $\frac{1}{2}(\log_3 x + \log_3 y) - \log_3(y + 2)$

10. $3\ln 2 - 4\ln x + \ln y$

Evaluate and round to four decimal places, may need to use change of base formula.

11. $\log_{0.5} 6$

12. $\log_7 35$

13. $\log 257,301$

14. $\ln 0.089$

15. e^5

16. $e^{-0.25}$

17. $\frac{\ln 3^2 4^3}{\ln 5^2}$

18. $\frac{\log_3 27}{\log_3 81}$

19. $\frac{e^{-7} - e^7}{10^3}$

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Answers

1. $8 \log M + 12 \log N$

2. $5 \log M + 4 \log N$

3. $-14 \log M - 6 \log N$

4. $\ln 7 + 4 - \ln 10$

5. $\frac{2}{3} + \frac{1}{3} \log_5 y$

6. $\ln x + \frac{3}{2} \ln y - 3 \ln z$

7. $\log \left(\frac{N^3}{M} \right)$

8. $\log (XY^2)$

9. $\log_3 \left(\frac{\sqrt{xy}}{y+2} \right)$

10. $\ln \left(\frac{8y}{x^4} \right)$

11. -2.5850

12. 1.8271

13. 5.4104

14. -2.4191

15. 148.4132

16. 0.7788

17. 1.9746

18. $\frac{3}{4}$

19. -1.0966