

Rules of Logarithms

Rules of Logarithms

If M , N , and a are positive real numbers with $a \neq 1$, and x is any real number, then

1. $\log_a MN = \log_a M + \log_a N$ Product Rule

2. $\log_a \frac{M}{N} = \log_a M - \log_a N$ Quotient Rule

3. $\log_a M^N = N \log_a M$ Power Rule

4. $\log_a a = 1$

5. $\log_a 1 = 0$

6. $\log_a a^x = x$ $\ln e^x = x$

7. $a^{\log_a x} = x$ $e^{\ln x} = x$

8. $\log_a \frac{1}{N} = -\log_a N$

Change of Base Formula

$$\log_a M = \frac{\log_b M}{\log_b a} = \frac{\log M}{\log a}$$

↑
Base 10

1. Rewrite $\log(31) + \log(18)$ as a single logarithm.
2. Express $\log_c(4) - \log_c(3)$ as a single logarithm.
3. Simplify: $\log_3(x+3) + \log_3(x+9)$
4. Simplify: $\log_a(x^2 - 25) - \log_a(x - 5)$

Rules of Logarithms

5. Express $\log\left(\frac{q}{10}\right)$ as a difference of logarithms.

6. Express $\ln(xy)$ as a sum of logarithms.

7. Rewrite $\log(16)$ in terms of $\log(4)$.

8. Rewrite $\log\sqrt{1600}$ in terms of $\log(2)$ and $\log(5)$.

9. Simplify $2^{\log_2(2x+5)}$

10. Simplify $\ln(e^{2x})$

11. Simplify $e^{\ln(3x+9)}$

12. Rewrite $\log_b(x^8 y^3 z)$ as a sum or difference of multiple of logarithms.

13. Express $\log\left(\frac{31}{3x}\right)$ as a difference of logarithms.

14. Rewrite $2\log_c x - \frac{1}{2}\log_c y$ as a single logarithm and simplify if possible.

15. Find an approximate rational solution to the equation $2^x = 7$.
Round your answer to 4 decimal places.

Rules of Logarithms

16. Find the $\log_5 80$ using the Change of Base formula. Round to 4 decimal places.
17. Solve $1.04^{2x} = 3$. Round your answer to 4 decimal places.
18. Solve $\log_x 64 = -3$
19. If \$50,000 is invested at 10% compounded quarterly, how long will it take for the investment to triple in value? (Leave your answer in years, rounding to two decimal places.)