

MODULE 6.1 - LOGARITHMIC PROPERTIES

LEARNING OBJECTIVES

In this section, you will:

- Use the product rule for logarithms.
- Use the quotient rule for logarithms.
- Use the power rule for logarithms.
- Expand logarithmic expressions.
- Condense logarithmic expressions.
- Use the change-of-base formula for logarithms.

USING THE PRODUCT RULE

- State the definition of the product rule for logarithms.

USING THE QUOTIENT RULE

- State the definition of the quotient rule for logarithms.

USING THE POWER RULE

- State the definition of the power rule for logarithms.

CONDENSING LOGARITHMIC EXPRESSIONS



How To... Given a sum, difference, or product of logarithms with the same base, write an equivalent expression as a single logarithm.

USING THE CHANGE-OF-BASE FORMULA FOR LOGARITHMS

- State the definition of the change-of-base formula.

MODULE 3.1 - CLASS EXAMPLES

Use the Product Rule of Logarithms to expand or condense the following logarithm as much as possible.

1. $\log_5(3x)$

2. $\log_3(30x(3x + 4))$

3. $\log_b(7) + \log_b(y)$

4. $\log(15) + \log(2 + 4z)$

Use the Quotient Rule of Logarithms to expand or condense the following logarithm as much as possible.

5. $\log\left(\frac{7}{b}\right)$

6. $\log_2\left(\frac{15x(x-1)}{(3x+4)(2-x)}\right)$

7. $\log_9(w) - \log_9(5)$

8. $\ln(v + 1) - \ln(x - 9)$

Use the Power Rule of Logarithms to expand or condense the following logarithm as much as possible.

9. $\log_2(x^5)$

10. $\ln\left(\frac{1}{x^2}\right)$

11. $7\log_4(y)$

12. $\frac{1}{2}\log_3(w)$

Use the properties of logarithms to expand or condense the logarithm as much as possible.

13. $\log\left(\frac{x^2y^3}{z^4}\right)$

14. $\ln\sqrt[3]{x^2}$

15. $\ln(x^2 + y^2)$

16. $\ln\left(\frac{\sqrt{(x-1)(2x+1)^2}}{x^2-9}\right)$

17. $\log(3) - \log(4) + \log(5) - \log(6)$

18. $\log(5) + 0.5\log(x) - \log(7x - 1) - 3\log(x - 1)$

19. $\log(5) + 0.5\log(x) - \log(7x - 1) - 3\log(x - 1)$

For the following exercises, use the properties of logarithms to evaluate without using a calculator.

20. $\log_2(4) - \log_2\left(\frac{1}{8}\right)$

21. $2\log_{16}(4) + \log_{16}\left(\frac{1}{256}\right)$

For the following exercises, rewrite the expression as an equivalent ratio of logs using base e .

22. $\log_7(15)$

23. $\log_3(22)$