

HW29: Properties of Logarithms Homework  
Module 2, Unit 4, Lesson 5

Write each equation in its equivalent exponential form.

1.  $4 = \log_2 16$

2.  $2 = \log_3 x$

3.  $5 = \log_b 32$

Write each equation in its equivalent logarithmic form.

4.  $5^4 = 625$

5.  $2^{-4} = \frac{1}{16}$

6.  $13^2 = x$

Evaluate each expression without using a calculator.

7.  $\log_4 16$

8.  $\log_2 64$

9.  $\log_5 \frac{1}{5}$

10.  $\log_2 \frac{1}{8}$

11.  $\log_7 \sqrt{7}$

12.  $\ln 1$

13.  $\log 100$

14.  $7^{\log_7 23}$

15.  $\ln \frac{1}{e^7}$

16.  $10^{\log \sqrt{x}}$

17.  $\ln e^6$

18.  $\log_2 \frac{1}{\sqrt{2}}$

Use properties of logarithms to expand each logarithmic expression as much as possible. Where possible, evaluate logarithmic expressions without using a calculator.

19.  $\log_5(7 \cdot 3)$

20.  $\log(1000x)$

21.  $\log\left(\frac{x}{100}\right)$

22.  $\log_4\left(\frac{64}{y}\right)$

23.  $\log_4\left(\frac{\sqrt{x}}{64}\right)$

24.  $\log_b\left(\frac{\sqrt{xy^3}}{z^3}\right)$

25.  $\ln\left(\frac{x^3\sqrt{x^2+1}}{(x+1)^4}\right)$

26.  $\log\left(\frac{10x^2\sqrt[3]{1-x}}{7(x+1)^2}\right)$

Use properties of logarithms to condense each logarithmic expression as much as possible. Write each expression as a single logarithm whose coefficient is 1. Where possible, evaluate logarithmic expressions without using a calculator.

27.  $\log 5 + \log 2$

28.  $\log x + 3 \log y$

29.  $3 \ln x - \frac{1}{3} \ln y$

30.  $4 \ln(x + 6) - 3 \ln x$

31.  $\frac{1}{2}(\log x + \log y)$

32.  $\frac{1}{3}[2 \ln(x + 5) - \ln x - \ln(x^2 - 4)]$

33.  $\log_2 96 - \log_2 3$

34.  $\log x + \log(x^2 - 1) - \log 7 - \log(x + 1)$

## Answers

1.  $2^4 = 16$

2.  $3^2 = x$

3.  $b^5 = 32$

4.  $\log_5 625 = 4$

5.  $\log_2 \frac{1}{16} = -4$

6.  $\log_{13} x = 2$

7. 2

8. 6

9. -1

10. -3

11.  $\frac{1}{2}$

12. 0

13. 2

14. 23

15. -7

16.  $\sqrt{x}$

17. 6

18.  $-\frac{1}{2}$

19.  $\log_5 7 + \log_5 3$

20.  $3 + \log x$

21.  $\log x - 2$

22.  $3 - \log_4 y$

23.  $\frac{1}{2} \log_4 x - 3$

24.  $\frac{1}{2} \log_b x + 3 \log_b y - 3 \log_b z$

25.  $3 \ln x + \frac{1}{2} \ln(x^2 + 1) - 4 \ln(x + 1)$

26.

$1 + 2 \log x + \frac{1}{3} \log(1 - x) - \log 7 - 2 \log(x + 1)$

27. 1

28.  $\log(xy^3)$

29.  $\ln\left(\frac{x^3}{\sqrt[3]{y}}\right)$

30.  $\ln \frac{(x+6)^4}{x^3}$

31.  $\log \sqrt{xy}$

32.  $\ln_3 \sqrt[3]{\frac{(x+5)^2}{x(x^2-4)}}$

33. 5

34.  $\log \frac{x(x^2-1)}{7(x+1)}$