

Express as the sum, difference and/or product of logarithms.

1.  $\log_2(5x)$

2.  $\log_3(xy)$

3.  $\log_2(8xy)$

4.  $\ln(xy^3)$

5.  $\log(x^2y^3)$

6.  $\log_3(81xy^2)$

7.  $\log_4(\sqrt[3]{x})$

8.  $\log(x\sqrt{y})$

9.  $\log_5(x^4y^{-2})$

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

11.  $\log_2\left(\frac{ax^3}{y^4}\right)$

12.  $\log\left(\frac{\sqrt{y}}{\sqrt[3]{x}}\right)$

13.  $\log_4\left(\sqrt[5]{\frac{x}{y^2}}\right)$

14.  $\log\left(\frac{5}{x-1}\right)$

15.  $\log_2\left(\frac{x-1}{y}\right)$

16.  $\log_6\left(\frac{x^2-9}{x+2}\right)$

17.  $\log\left(\frac{x^2}{x-1}\right)$

18.  $\log_3\left(\frac{x-1}{x-4}\right)$

**Write as a single logarithm.**

19.  $2\log_3 x + \log_3 5$

20.  $2\log_5 x + 3\log_5 y$

21.  $4\log x + 3\log 2 + \log y$

22.  $\log 3 + \log(2x - 5)$

23.  $\log x + \log(x - 3)$

24.  $2\log_3 x + \log_3(x + 4)$

25.  $\log(x + 1) + \log(x - 3)$

26.  $\log_7(x + 2) + \log_7(x - 2)$

27.  $\log_4(2x + 1) + \log_4(3x + 2)$

28.  $2\log 4 - 2\log x$

29.  $2\log_5 x - 3\log_5 y$

30.  $4\log_5 x - \log_5(x - 3)$

31.  $\frac{1}{2}\log x - \frac{1}{3}\log y$

32.  $\log_3(x - 3) - \log_3(x^2 - 9)$

33.  $\log_3(x^3 - 8) - \log_3(x - 2)$

34.  $\frac{1}{2}\log_2 9 + \log_2(2x - 1) - \log_2(3x)$

35.  $3\log_2 x + \log_2(x - 3) - \log_2 x$