

NO CALCULATORS, except where noted.

Evaluate using the properties of logarithms.

1.  $\log_2(4 \cdot 8)$

2.  $\ln e^{-3}$

3.  $\log_2 4^3$

4.  $\log_5 25$

5.  $\log_3 9^5$

6.  $\log \frac{1}{100}$

7.  $\ln \frac{1}{e^5}$

8.  $\log_4 8$

9.  $\log_{\otimes} (\otimes^{\Delta})^{\alpha}$

Expand the expression.

9.  $\ln 9y$

10.  $\log_2 \frac{3x^7}{y}$

11.  $\ln(2x^2\sqrt{y})$

12.  $\log_5 \sqrt[3]{2x^4y}$

13.  $\log_3 27x^2y^8$

14.  $\log_7 49^2$

Condense the expression.

15.  $\log_7 12 - \log_7 3$

16.  $\log_4 6 + 2\log_4 3 - \log_4 27$

17.  $\frac{1}{2} \ln 16 - \ln 6 + \ln 5$

18.  $2(\ln 12 - \ln 4) - \ln 8$

19.  $\frac{1}{3}(\log_2 54 - \log_2 2) - 2(\log_2 3 + \log_2 4)$

Use the change of base formula to evaluate the expressions. You may use a calculator.

20.  $\log_6 23$

21.  $\log_4 21$

22.  $\log_{\frac{1}{2}} 13$

23.  $\log_8 \frac{18}{7}$

Use your table to approximate the following values.

24.  $\log 12$

25.  $\log 396$

26.  $\log 3,500$

27.  $\log .735$

28.  $\log .0139$

29.  $\log .0031$

Use  $\log_b 12 = 1.1949$ ,  $\log_b 4 = .6667$  to find the following.

38.  $\log_b 3$

39.  $\log_b 16$

40.  $\log_b 9$

41.  $\log_b 24$