

NO CALCULATORS, except where noted.

Evaluate using the properties of logarithms.

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

5

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

-3

3.  $\log_2 4^3$

6

4.  $\log_5 25$

2

5.  $\log_3 9^5$

10

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

-2

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

-5

8.  $\log_4 8$

 $\frac{3}{2}$ 

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

 $\Delta \alpha$ 

Expand the expression.

9.  $\ln 9y$

$$\ln 9 + \ln y$$

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

$$\log_2 3 + 7 \log_2 x - \log_2 y$$

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

$$\ln 2 + 2 \ln x + \frac{1}{2} \ln y$$

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

$$\frac{1}{3} (\log_5 2 + 4 \log_5 x + \log_5 y)$$

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

$$3 + 2 \log_3 x + 8 \log_3 y$$

14.  $\log_7 49^2$

4

Condense the expression.

15.  $\log_7 12 - \log_7 3$

$$\log_7 4$$

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

$$\log_4 2 = \frac{1}{2}$$

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

$$\ln\left(\frac{10}{3}\right)$$

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

$$\ln\left(\frac{9}{8}\right)$$

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

$$\log_2\left(\frac{1}{48}\right)$$

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

20.  $\log_6 23$

$$1.7500$$

21.  $\log_4 21$

$$2.1962$$

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

$$-3.7004$$

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

$$.4542$$

Use your table to approximate the following values.

24.  $\log 12$

$$1.0792$$

25.  $\log 396$

$$2.5977$$

26.  $\log 3,500$

$$3.5441$$

27.  $\log .735$

$$-.1337$$

28.  $\log .0139$

$$-1.8570$$

29.  $\log .0031$

$$-2.5086$$

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

38.  $\log_b 3$

$$.5282$$

39.  $\log_b 16$

$$1.3334$$

40.  $\log_b 9$

$$1.0564$$

41.  $\log_b 24$

$$1.52825$$