

## SM3 7.4 Log Properties

Rewrite the following using logarithmic properties. Simplify if appropriate.

1.  $\log[(2)(3)]$

$\log 2 + \log 3$

2.  $\log \frac{2}{3}$

$\log 2 - \log 3$

3.  $\log 2^3$

$3 \log 2$

4.  $\log_4 3^x$

$x \log_4 3$

5.  $\log 2x$

$\log 2 + \log x$

6.  $\log_2 \frac{x}{2}$

$\log_2 x - \log_2 2$   
 $\log_2 x - 1$

7.  $\log_5 x^3$

$3 \log_5 x$

8.  $\log_4 [x(2-x)]$

$\log_4 x + \log_4 (2-x)$

9.  $\log_3 \frac{5}{x+3}$

$\log_3 5 - \log_3 (x+3)$

10.  $\log_2 (x+1)^4$

$4 \log_2 (x+1)$

11.  $\log \sqrt{x}$

$\frac{1}{2} \log x$

12.  $\log \sqrt[3]{x+3}$

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

13.  $\log_4 [x(x-2)^4]$

$\log_4 x + 4 \log_4 (x-2)$

14.  $\log_3 [x(x+1)]^5$

$5 \log_3 x + 5 \log_3 (x+1)$

15.  $\log \sqrt[4]{\frac{x+1}{x-1}}$

$\frac{1}{4} \log (x+1) - \frac{1}{4} \log (x-1)$

16.  $\log_3 \frac{\sqrt{x}}{3+x^2}$

$\frac{1}{2} \log_3 x - \log_3 (3+x^2)$

17.  $\ln(2x)$

$\ln(2) + \ln(x)$

18.  $\ln \frac{x}{3}$

$\ln(x) - \ln(3)$

19.  $\ln x^3$

$3 \ln(x)$

20.  $\ln [x(x-1)^4]$

$\ln(x) + 4 \ln(x-1)$

21.  $\ln [(x-2)(x+3)]^2$

$2 \ln(x-2) + 2 \ln(x+3)$

22.  $\ln(x^2 - 16)$

$\ln(x+4)(x-4)$   
 $\ln(x+4) + \ln(x-4)$

23.  $\ln \frac{x^2 + 3x - 4}{x^2 - 25}$   
 $\ln \frac{(x+4)(x-1)}{(x+5)(x-5)}$

$\ln(x+4) + \ln(x-1) - \ln(x+5) - \ln(x-5)$

$$24. \ln[3x^4(9-2x)] \qquad 25. \ln \frac{x^2-4}{(x+2)(x-2)} \qquad 26. \ln(x^4+3x^3+2x-1)^2$$

$$\ln 3 + 4 \ln x + \ln(9-2x) \qquad \ln \frac{x^2-4}{x+2} \qquad 2 \ln(x^4+3x^3+2x-1)$$

$$\ln(x-2)$$

Rewrite the following using one logarithm.

$$27. \log_2 x + \log_2 y \qquad 28. 3 \log x \qquad 29. \log_2 x - \log_2 y$$

$$\log_2 xy \qquad \log x^3 \qquad \log_2 \frac{x}{y}$$

$$30. \frac{1}{2} \log_3(x-3) \qquad 31. 2 \log_5 x + \log_5(4+x) \qquad 32. \log(x-2) - \log(x+2)$$

$$\log_3 \sqrt{x-3} \qquad \log_5[x^2(4+x)] \qquad \log \frac{x-2}{x+2}$$

$$33. 3 \log_2(x^2) + 3 \log_2(x+10) \qquad 34. \log x + \log(x-2) + \log(x^3+3)$$

$$\log_2 x^6(x+10)^3 \qquad \log[x(x-2)(x^3+3)]$$

$$35. \log_4(x+3) + \log_4(x-3) - \log_4(x+7)$$

$$\log_4 \frac{x^2-9}{x+7}$$

$$36. \frac{2}{3} \log_7 x - \frac{1}{3} \log_7(4-x)$$

$$\log_7 \sqrt[3]{\frac{x^2}{4-x}}$$

$$37. \ln x + \ln 2 \qquad 38. \ln x - \ln 2 \qquad 39. 4 \ln x \qquad 40. \ln(x+1) + \ln 2$$

$$\ln 2x \qquad \ln \frac{x}{2} \qquad \ln x^4 \qquad \ln(2x+2)$$

$$41. 3 \ln x + 2 \ln(x+3) \qquad 42. \ln(x-5) + \ln(x+5) \qquad 43. \frac{1}{2} \ln x - \ln(4-x)$$

$$\ln x^3 + \ln(x+3)^2 \qquad \ln(x-5)(x+5) \qquad \ln \sqrt{x} - \ln(4-x)$$

$$\ln[x^3(x+3)^2] \qquad \ln(x^2-25) \qquad \ln \left( \frac{\sqrt{x}}{4-x} \right)$$

$$44. \ln e^0 + e^{\ln x} \\ 0 + x \\ x$$

$$45. \ln x + \ln y - \ln z \\ \ln xy - \ln z \\ \ln\left(\frac{xy}{z}\right)$$

$$46. 3[\ln(x-2) + \ln(3+x)] \\ 3 \ln(x-2) + 3 \ln(x+3) \\ \ln(x-2)^3 + \ln(x+3)^3 \\ \ln(x-2)^3(x+3)^3$$

Rewrite the following in base 10.

$$47. \log_2 3$$

$$\frac{\log 3}{\log 2}$$

$$48. \log_8 4$$

$$\frac{\log 4}{\log 8}$$

$$49. \log_3 x^2$$

$$\frac{\log x^2}{\log 3}$$

$$50. \log_3(x-2)$$

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

$$51. \log_7(x+5)$$

$$\frac{\log(x+5)}{\log 7}$$

$$52. \log_3 \sqrt[3]{x-4}$$

$$\frac{\log(x-4)}{3 \log 3}$$

$$53. \log_5 12x$$

$$\frac{\log 12x}{\log 5}$$

$$54. \log_4(x+7)$$

$$\frac{\log(x+7)}{\log 4}$$

Rewrite in Base e

$$55. \log_4 10$$

$$\frac{\ln 10}{\ln 4}$$

$$56. \log_2 4$$

$$\frac{\ln 4}{\ln 2} = \frac{\ln 2^2}{\ln 2} =$$

$$\frac{2 \ln 2}{\ln 2} = 2$$

$$57. \log_4 x^3$$

$$\frac{\ln x^3}{\ln 4} =$$

$$\frac{3 \ln x}{\ln 4}$$

$$58. \log_7(x+10)$$

$$\frac{\ln(x+10)}{\ln 7}$$

$$59. \log_3(x-5)$$

$$\frac{\ln(x-5)}{\ln 3}$$

$$60. \log_3 \sqrt[4]{2x-4}$$

$$\frac{\ln \sqrt[4]{2x-4}}{\ln 3} =$$

$$\frac{\ln(2x-4)}{4 \ln 3} =$$

$$\frac{\ln 2 + \ln(x-2)}{4 \ln 3}$$

$$61. \log_2 3x$$

$$\frac{\ln 3x}{\ln 2} =$$

$$\frac{\ln 3 + \ln x}{\ln 2}$$

$$62. \log_5(3x+7y)$$

$$\frac{\ln(3x+7y)}{\ln 5}$$

