

More Practice with Laws of Logs

Expand each of the following as much as possible using laws of logarithms. When applicable, write "not possible."

1) $\log\left(\frac{x^3 y^6}{\sqrt{z}}\right)$

2) $\log\sqrt[4]{x^2 + y^2}$

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

4) $\log\left(\frac{x}{\sqrt[3]{1-x}}\right)$

5) $\log\sqrt[3]{\frac{x+y}{x^6}}$

6) $\ln(x-y)$

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Condense each of the following into a single logarithm using properties of logs:

7) $6\log x - 2\log y + \frac{1}{3}\log t$

8) $5\log x - \frac{1}{4}\log(x^2 + 1) + 2\log(x-1)$

9) $\ln\left(\frac{a}{a^2 - b^2}\right) + \ln\left(\frac{a-b}{a^2}\right)$

10) $2(\log_5 x - 3\log_5 z + 2\log_5 y)$

11) $3\ln x - \left(2\ln y + \frac{1}{2}\ln z\right)$

12) $4(2\ln x - 3\ln y) + 3(4\ln y - \ln x)$

13) $\frac{1}{3}(\log_4 x + 6\log_4 y)$

14) $\log(x+3) - (\log(x^2 - 9) - \log(x^3 - 27))$

15) $4\ln x - \frac{1}{2}\left(6\ln y - \frac{1}{4}\ln z\right)$

Solve each of the following:

16) $30 = 32(1 - 2^{-t})$

17) $\log_3(x+2) = 4$

18) $\frac{10}{1 + e^{-x}} = 2$

19) $\log_5(x+1) - 2 = \log_5(x-1)$

20) $2 = \log_2(x^2 - x - 2)$

21) $\ln(x+4) = 3$

22) $\log_2(3x+2) = 3 + \log_2 x$

23) $2 \log_5 x - \log_5 9 = 2$

24) $\log(x^2) = \log 4 + \log 5$

25) $\log_{\sqrt{216}} x = \frac{4}{3}$

26) $\log_9 8 = \log_9 \frac{1}{2} + 2 \log_9 x$

27) $6e^{2x} + 45 = 3e^{4x}$

28) $\left(\frac{1}{16}\right)^x = 64$

29) $9^{2x} \cdot \left(\frac{1}{27}\right)^{x-1} = 81$

30) $\log_3(x-1) - \log_3(x+6) = \log_3(x-2) - \log_3(x+3)$

Evaluate:

31) $\log_{25} \left(\frac{125}{\sqrt[3]{5}} \right)$

32) $\log_{49} \left(\frac{1}{7} \right)$

33) $\log_8 \left(\frac{2}{\sqrt[4]{4}} \right)$

34) $\frac{\log_4 16}{\log_3 \left(\frac{1}{27} \right)}$

35) $\log_3 2 \div \log_3 8$

36) $\log_2 3 - \log_2 12$

37) Which of the following $\frac{\log 27}{\log 3}$? (Circle all that apply)

a) $\log 9$

b) 3

c) $-\log 3^{-1}$

d) $\log 24$

38) Which of the following are equivalent?

i. $\frac{\log_6 216}{\log_6 36}$

ii. $\log_6 \frac{216}{36}$

iii. $\log_6 216 - \log_6 36$

a) *i & ii*b) *ii & iii*c) *iii*

d) none of these

e) all of these

39) Which of the following are equivalent?

i. $\frac{1}{3} \log 270$

ii. $\log 90$

iii. $\frac{1}{3} + \log 3$

a) *i & ii*b) *i & iii*c) *ii & iii*

d) none of these

e) all of these

40) Given $\log 7 = x$, $\log 5 = y$, $\log 3 = z$ determine each of the following:

a) $\log 9$

b) $\log 150$

c) $\log_5 7$

d) $\log_7 15$

e) $\log (3/5)$

f) $\log 30$

41) State the domain of each of the following:

a) $f(x) = \ln(9 - x)$

b) $f(x) = \ln(3x + 2)$

42) State the transformations applied to the graph of $f(x)$ which result in the graph of $g(x)$.

a) $f(x) = \left(\frac{4}{5}\right)^x$

b) $f(x) = 3^x$

c) $f(x) = 2^x$

d) $f(x) = e^x$

$g(x) = 3\left(\frac{5}{4}\right)^{x+3}$

$g(x) = \frac{1}{5} \cdot 9^{x-1} + 4$

$g(x) = -3\left(\frac{1}{4}\right)^{2-x} - 1$

$g(x) = -e^{6-3x}$

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43) Given that $f(x) = \ln(x + 3)$ determine each of the following:

a) $f(-3) =$ _____

b) $f(-2) =$ _____

c) $f(2) =$ _____

d) $f(2x) =$ _____

d) $f(x^2 - 3) =$ _____

e) $f(x^2 - 12) =$ _____

f) $f(x^2 + 6x + 6) =$ _____

44) Now...using your answers from #43 determine whether each of the following is TRUE or FALSE:

a) $f(-3) = 0$

b) $f(-2) = 0$

c) $f(2x) = f(2) + f(x)$

d) $f(x^2 - 3)$ has a domain of all real numbers

e) $f(x^2 - 12) = f(x) + \ln(x - 3)$

f) $\frac{1}{2}f(x^2 + 6x + 6) = f(x)$