7.2 Practice – LOGARITHMIC FUNCTIONS

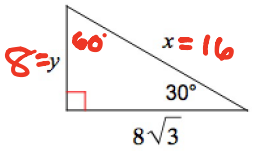
Name: _____

Pre-Calculus

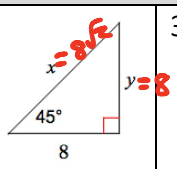
You might as well get these bad boys out of the way first. Solve for each unknown variable.

Quick Review

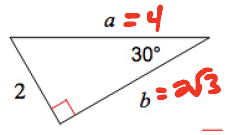
1.

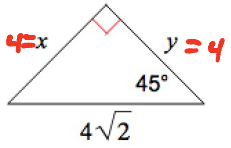


2.



3.





For 4-6, Expand the logarithm. (NOT L I K E T H I S ! ! !)

4. $log_3 ab^2c$

$= \log_3 a + \log_3 b^2 + \log_3 c$

$= \log_3 a + 2\log_3 b + \log_3 c$

5. $\ln \frac{x^2}{\sqrt{y}}$

$= \ln x^2 - \ln \sqrt{y}$

$= 2\ln x - \frac{1}{2}\ln y$

6. $\log \left(\frac{(xy)^2}{z}\right)^3$

$= 3\log\left(\frac{x^2y^2}{z}\right)$

$= 3\log x^2 + 3\log y^2 - 3\log z$

$= 6\log x + 6\log y - 3\log z$

For 4-6, Rewrite the expression as a single log. (C o n d e n se!)

7. log a – 2 log b + 3 log c

$= \log a - \log b^2 + \log c^3$

$= \log \frac{ac^3}{b^2}$

8. 2 ln x + 5 ln y – ln z^3

$= \ln x^2 + \ln y^5 - \ln z^3$

$= \ln \frac{x^2y^5}{z^3}$

9. $log_3\ y + 7log_3\ x + \frac{log_3\ z}{4}$

$= \log_3 y + \log_3 x^7 + \log_3 z^{\frac{1}{4}}$

$= \log_3 x^7 y z^{\frac{1}{4}}$

Solve for x using the "Bean method" (change of base formula). Show your work! Go out four places!

10. $4^x = 14$

$\log 4^x = \log 14$

$x \log 4 = \log 14$

$x = \frac{\log 14}{\log 4}$

$x \approx 1.9037$

11. $8^x = 12$

$\log 8^x = \log 12$

$x \log 8 = \log 12$

$x = \frac{\log 12}{\log 8}$

$x \approx 1.1950$

12. $100^x = 1000$

$\log 100^x = \log 1000$

$x \log 100 = \log 1000$

$x \cdot 2 = 3$

$x = 3/2$

Solve for x by using the "Brust method" (canceling the base with logs). Show your work! Go out four places!

13. $5^x = 15$

$\log_5 5^x = \log_5 15$

$x = \log_5 15$

$x \approx 1.6826$

14. $4^x = 1024$

$\log_4 4^x = \log_4 1024$

$x = \log_4 4^5$

$x = 5$

15. $100^x = 50$

$\log_{100} 100^x = \log_{100} 50$

$x = \log_{100} 50$

$x \approx .8495$

Solve for x by using the Sully method (by graphing). Tell the point of intersection used to solve the equation.

16. $3^x = 13$

x = 2.3347 Point (2.3, 13)

17. $15^x = 4$

x = .5119 Point (.51, 4)

18. $100^x = 10$

x = .5000 Point (1/2, 10)

Find x, y, or b as indicated in the following problems.

19. $log_2 x = 2$

$2^2 = x$

$4 = x$

20. $log_{16} 8 = y$

$\frac{\log_2 8}{\log_2 16} = y$

$\frac{3}{4} = y$

21. $log_b 16 = 2$

$b^2 = 16$

$b = 4$

(base must be >0)

22. $log_b 1 = 0$

$b^0 = 1$

$b \in \mathbb{R}, b \neq 0$

23. $log_4 x = \frac{1}{2}$

$4^{\frac{1}{2}} = x$

$2 = x$

24. $log_{\frac{1}{3}} 9 = y$

$\left(\frac{1}{3}\right)^y = 9$

$3^{-y} = 3^2$

$-y = 2$

$y = -2$

25. $log_b 1000 = \frac{3}{2}$

$\left(b^{3/2}\right)^{\frac{1}{3}} = (1000)^{\frac{1}{3}}$

$\left(b^{\frac{1}{2}}\right)^2 = (10)^2$

$b = 100$

Use logarithms to find the inverse of the given function.

26. $f(x) = 6^x$

$x = 6^y$

$\log x = \log 6^y$

$\log x = y \log 6$

$\frac{\log x}{\log 6} = y$

27. $f(x) = 3^x + 4$

$x = 3^y + 4$

$x - 4 = 3^y$

$\log(x-4) = \log 3^y$

$\log(x-4) = y \log 3$

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

28. $f(x) = 3^{x-1}$

$x = 3^{y-1}$

$\log x = \log 3^{y-1}$

$\log x = (y-1)\log 3$

$\frac{\log x}{\log 3} = y - 1$

$\frac{\log x}{\log 3} + 1 = y$

29. $f(x) = \ln(3x)$

$x = \ln(3y)$

$e^x = e^{\ln(3y)}$

$e^x = 3y$

$\frac{1}{3}e^x = y$

30. $\log y = 3 \log x + 4$

$\log x = 3 \log y + 4$

$\log x - 4 = 3 \log y$

$\frac{1}{3}\log x - \frac{4}{3} = \log y$

$10^{\frac{1}{3}\log x - \frac{4}{3}} = 10^{\log y}$

$10^{\frac{1}{3}\log x - \frac{4}{3}} = y$

31*. $\log y = \frac{\log x + 4}{2}$

$\log x = \frac{\log y + 4}{2}$

$2\log x = \log y + 4$

$2\log x - 4 = \log y$

$2(\log x - 2) = \log y$

$10^{2(\log x - 2)} = 10^{\log y}$

$100^{\log x - 2} = y$

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32. **Condense into a single logarithm.**

$\frac{\log_7 w}{3} - \log_7 y^2 + \frac{\log_7 z}{2}$

$= \frac{1}{3}\log_7 w - \log_7 y^2 + \frac{1}{2}\log_7 z$

$= \log_7 \sqrt[3]{w} - \log_7 y^2 + \log_7 \sqrt{z}$

$= \log_7 \frac{\sqrt[3]{w}\sqrt{z}}{y^2}$

32. **Expand.**

$\ln \frac{x^3\sqrt{y}}{z}$

$= \ln x^3 + \ln y^{\frac{1}{2}} - \ln z$

$= 3\ln x + \frac{1}{2}\ln y - \ln z$