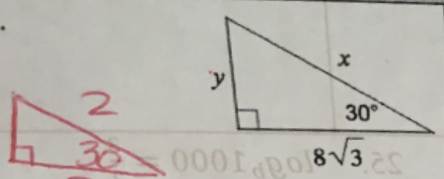
7.2 Practice – LOGARITHMIC FUNCTIONS Name: Sullamy P.

Pre-Calculus

Quick Review

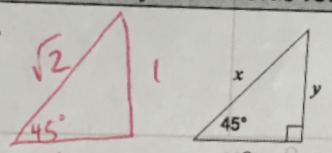
You might as well get these bad boys out of the way first. Solve for each unknown variable.

1.



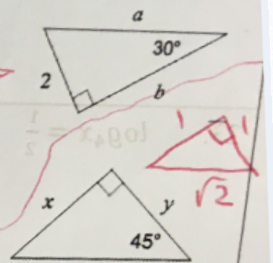
$\frac{y}{1} = \frac{8\sqrt{3}}{\sqrt{3}}$, $y = 8$, $x = 16$

2.



$\frac{\sqrt{2}}{x} = \frac{1}{8}$, $x = 8\sqrt{2}$, $y = 8$

3.



$\frac{1}{2} = \frac{2}{a}$, $a = 4$, $b = 2\sqrt{3}$, $x = y = 4$

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

4. $\log_3 ac^2$

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

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

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

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

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

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

7. $\log a - 2\log b + 3\log c$

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

8. $2\ln x + 5\ln y - \ln z^3$

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

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

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

$= \log_3 x^7 y \sqrt[4]{z}$

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

10. $4^x = 14$

$\log 4^x = \log 14$

$x\log 4 = \log 14$

$x = \frac{\log 14}{\log 4} = 1.9037$

11. $8^x = 12$

$\log 8^x = \log 12$

$x\log 8 = \log 12$

$x = \frac{\log 12}{\log 8} = 1.1950$

12. $100^x = 1000$

$\log 100^x = \log 1000$

$x = \frac{\log 1000}{\log 100}$

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

DO THOSE IN YOUR HEAD!!

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

13. $5^x = 15$

$\log_5 5^x = \log_5 15$

$x = \log_5 15 = 1.6826$

14. $4^x = 1024$

$\log_4 4^x = \log_4 1024$

$x = 5$

15. $100^x = 50$

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

$x = .8495$

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 ($\frac{1}{2}$, 10)

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

19. $log_2 x = 2$

$x = 4$

20. $log_{16} 8 = y$

$16^y = 8$

$\log 16^y = \log 8$

$\boxed{y = \frac{\log 8}{\log 16} = \frac{4}{3}}$

21. $log_b 16 = 2$

$b^2 = 16$

$\boxed{b = 4}$

22. $log_b 1 = 0$

$b \in \mathbb{R}$ "all Real #'s NOT 0"

$b \neq 0$

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

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

$2 = x$

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

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

$\boxed{y = -2}$

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

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

$\boxed{b = 1000^{\frac{2}{3}} = 100}$

Use logarithms to find the inverse of the given function.

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

$y = 6^x$

switch $x \leftrightarrow y$

$x = 6^y$

$\log x = \log 6^y$

$\log x = y \log 6$

$\frac{\log x}{\log 6} = y = f^{-1}(x)$

$\boxed{y = 1.285 \log x}$

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

$y = 3^x + 4$

$x = 3^y + 4$

$x - 4 = 3^y$

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

$\boxed{2.096 \log(x-4) = y}$

28. ~~$f(x) = 6^x$~~

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

$y = 3^{x-1}$

$x = 3^{(y-1)}$

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

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

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

$\boxed{2.096 \log x + 1 = f^{-1}(x)}$

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

$y = \ln 3x$

$x = \ln 3y$

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

$e^x = 3y$

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

$\boxed{\frac{e^x}{3} = f^{-1}(x)}$

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

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

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

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

$10 \qquad 10$

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

$\boxed{10^{\frac{1}{3}\log x - \frac{4}{3}} = f^{-1}(x)}$

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

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

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

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

$10 \qquad 10$

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

$\boxed{100^{\log x - 2} = f^{-1}(x)}$

Santa will be extra proud if you get this one

2. **Condense into a single logarithm.**

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

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

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

or

$\boxed{\log_7 \frac{w^{\frac{1}{3}} z^{\frac{1}{2}}}{y^2}}$

32. **Expand.**

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

add SUBTRACT

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