AFM UNIT 1 Name key Fall 16

HW 2 - Log Properties and Exponential Equations

Condense each expression to a single logarithm.

1) $6\log_8 u - 36\log_8 v$

$\log_8 \frac{u^6}{v^{36}}$ or $\log_8\left(\frac{u}{v^6}\right)^6$

2) $\frac{\log_9 u}{3} + \frac{\log_9 v}{3} + \frac{\log_9 w}{3}$

$\frac{1}{3}\log_9 u + \frac{1}{3}\log_9 v + \frac{1}{3}\log_9 w$

$\log_9 \sqrt[3]{u} + \log_9 \sqrt[3]{v} + \log_9 \sqrt[3]{w}$

$\log_9 \sqrt[3]{uvw}$

3) $12\log_5 6 - 6\log_5 7$

$\log_5 \frac{6^{12}}{7^6}$ or $\log_5\left(\frac{6^2}{7}\right)^6$

4) $5\log_9 u + 30\log_9 v$

$\log_9 u^5 + \log_9 v^{30}$

$\log_9 u^5 v^{30}$ or $\log_9 (uv^6)^5$

5) $\log_5 x + \log_5 y + 6\log_5 z$

$\log_5 xyz^6$

6) $6\log_2 w + \frac{\log_2 u}{3}$

$\log_2 w^6 + \log_2 \sqrt[3]{u}$

$\log_2 w^6 \sqrt[3]{u}$

7) $5\log_4 w + \frac{\log_4 u}{2}$

$\log_4 w^5 + \log_4 \sqrt{u}$

$\log_4 w^5 \sqrt{u}$

8) $\frac{\log_7 x}{2} + \frac{\log_7 y}{2} + \frac{\log_7 z}{2}$

$\log_7 \sqrt{x} + \log_7 \sqrt{y} + \log_7 \sqrt{z}$

$\log_7 \sqrt{xyz}$

Expand each logarithm.

9) $\log_7 \left(\frac{x}{y^4}\right)^4$

$4\log_7 \frac{x}{y^4}$

$4\log_7 x + 16\log_7 y$

10) $\log_9 (a^6 \cdot b)^6$

$36\log_9 a + 36\log_9 b$

11) $\log_5 (7^6 \sqrt[3]{3})$

$6\log_5 7 + \frac{1}{3}\log_5 3$

$6\log_5 7 + \frac{\log_5 3}{3}$

12) $\log_6 \frac{2^6}{11^5}$

$6\log_6 2 - 5\log_6 11$

13) $\log_3(u \cdot v \cdot w^3)$

$\log_3 u + \log_3 v + 3\log_3 w$

14) $\log_6\left(\frac{a^6}{b}\right)^6$

$36\log_6 a - 6\log_6 b$

15) $\log_9(8^5\sqrt{7})$

$5\log_9 8 + \frac{\log_9 7}{2}$

16) $\log_7(w^4\sqrt{u})$

$4\log_7 w + \frac{\log_7 u}{2}$

Solve each equation. Round your answers to four decimal places.

17) $81^n = 27$

$\log_{81} 27 = n$

$n = 3/4$ or $.75$

18) $36^{n+3} = \left(\frac{1}{6}\right)^{n+3}$

$(6)^{2(n+3)} = (6)^{-1(n+3)}$

$2n+6 = -n-3$

$3n = -9$

$n = -3$

19) $11^{n-6} + 6 = 53$

$11^{n-6} = 47$

$\log_{11} 47 = n-6$

$n = 7.6056$

20) $7^{2x} + 1.8 = 7$

$7^{2x} = 5.2$

$\log_7 5.2 = 2x$

$x = .4236$

21) $7 \cdot 10^x + 8 = 24$

$7 \cdot 10^x = 16$

$10^x = 16/7$

$\log_{10} \frac{16}{7} = x$

$x = .3590$

22) $2^{6v+1} + 4.5 = 42$

$2^{6v+1} = 37.5$

$\log_2 37.5 = 6v+1$

$v = .7048$

23) $3 \cdot 13^{0.8x-3} + 4 = 29$

$3 \cdot 13^{0.8x-3} = 25$

$13^{0.8x-3} = 25/3$

$\log_{13} \frac{25}{3} = 0.8x-3$

$x = 4.7833$

24) $3 \cdot 3^{-6b-8} - 4 = -1$

$3 \cdot 3^{-6b-8} = 3$

$3^{-6b-8} = 1$

$\log_3 1 = -6b-8$

$0 = -6b-8$

$b = -1.3333$

25) $64^{2-b} = \frac{1}{8}$

$\log_{64} \frac{1}{8} = 2-b$

$-1/2 = 2-b$

$b = 2.5$

26) $16^{3n} = 4^3$

$4^{2(3n)} = 4^3$

$6n = 3$

$n = 1/2$

27) $\left(\frac{1}{625}\right)^{-n+3} = 125^{-n}$

$(5)^{-4(-n+3)} = (5)^{3(-n)}$

$4n-12 = -3n$

$7n = 12$

$n = 1.7143$

28) $6^{3n} - 6 = -40$

$6^{3n} = -34$

$\log_6 -34 = 3n$

↑ can't have a negative log.

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