AFM Name_____ ID: 1

Log Graphs and Equations Review

Rewrite each equation in exponential form.

1) $\log_x 164 = y$

$x^y = 164$

2) $\log_{\frac{7}{10}} x = y$

$\left(\frac{7}{10}\right)^y = x$

Rewrite each equation in logarithmic form.

3) $9^x = 76$ $\log_9 76 = x$

4) $x^y = 16$ $\log_x 16 = y$

Identify the domain, range, and equation of the asymptote of each.

5) $y = \log_5 (x-1) + 4$

D: $x > 1$
R: $y = \mathbb{R}$
A: $x = 1$

6) $y = \log_2 (x-3)$

D: $x > 3$
R: $y = \mathbb{R}$
A: $x = 3$

7) $y = \log_3 (x+4) - 3$

D: $x > -4$
R: $y = \mathbb{R}$
A: $x = -4$

8) $y = \log_5 (x+5)$

D: $x > -5$
R $y = \mathbb{R}$
A $x = -5$

Use a calculator to approximate each to the nearest thousandth. Show your setup.

9) $\log_3 2.9$ $\frac{\log 2.9}{\log 3} = .969$

10) $\ln 3.4$ 1.224

11) $\log_2 48$ $\frac{\log 48}{\log 2} = 5.585$

12) $\log_6 6.8$ $\frac{\log 6.8}{\log 6} = 1.070$

Solve each equation.

13) $\log_2 8p = 1$ $2^1 = 8p$ $2 = 8p$ $p = \frac{1}{4}$

14) $\log_9 -2k = -2$ $9^{-2} = -2k$ $\frac{1}{81} = -2k$ $k = -\frac{1}{162}$

15) $\log_3 6m = 2$ $3^2 = 6m$ $9 = 6m$ $\frac{3}{2} = m$

16) $\log_2 -10a = -2$ $2^{-2} = -10a$ $\frac{1}{4} = -10a$ $-\frac{1}{40} = a$

17) $2(4^{2x}) = 128$

$4^{2x} = 64$

$4^{2x} = 4^3$

$2x = 3$

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

18) $6(2^{2x}) = 48$

$2^{2x} = 8$

$2^{2x} = 2^3$

$2x = 3$

$x = 3/2$

19) $3(e^x) = 12$

$e^x = 4$

$\ln 4 = x$

$x = 1.39$

20) $7(10^{2x}) = 63$

$10^{2x} = 9$

$\log 9 = 2x$

$\frac{\log 9}{2} = x$

$x = .477$

21) You have been gifted $6500 to be placed in a bank account for 20 years at 4.25% interest. Show your work to determine the balance of the account if interest is compounded:

a. Quarterly $6500\left(1 + \frac{.0425}{4}\right)^{4 \cdot 20}$

b. Monthly $6500\left(1 + \frac{.0425}{12}\right)^{12 \cdot 20}$

c. Daily $6500\left(1 + \frac{.0425}{365}\right)^{365 \cdot 20}$

d. Continuously $6500\, e^{.045 \cdot 20}$

Solve each equation. Round your answers to the nearest ten-thousandth.

22) $-3 \cdot 14^{p-5} = -41$

$14^{p-5} = \frac{41}{3}$

$\log_{14} \frac{41}{3} = p - 5$

$5 + \log_{14} 41/3 = p$

$p = 5.991$

Solve each equation.

23) $-9 \cdot 10^{4x} = -50$

$10^{4x} = \frac{50}{9}$

$\log \frac{50}{9} = 4x$

$x = \frac{\log 50/9}{4}$

$x = .745$

24) $4^{-3x-3} \cdot \frac{1}{2} = 1$

$2^{2(-3x-3)} \cdot 2^{-1} = 2^0$

$-6x - 6 - 1 = 0$

$-6x - 7 = 0$

$-6x = 7$

$x = -7/6$

25) $36^n \cdot 216^{-2n-1} = 1$

$6^{2n} \cdot 6^{3(-2n-1)} = 6^0$

$2n + -6n - 3 = 0$

$-4n - 3 = 0$

$-4n = 3$

$n = -3/4$

26) $36^{-b-2} \cdot 36^{3b} = 216$

$6^{2(-b-2)} \cdot 6^{2(3b)} = 6^3$

$-2b - 4 + 6b = 3$

$4b - 4 = 3$

$4b = 7$

$b = 7/4$

27) $\frac{125}{625^{-3x}} = 1$

$\frac{5^3}{(5^4)^{-3x}} = 5^0$

$5^3 = 5^{-12x}$

$3 = -12x$

$-\frac{1}{4} = x$

28) $\log_4 (a^2 + 65) = \log_4 (-16a + 2)$

$a^2 + 65 = -16a + 2$

$a^2 + 16a + 63 = 0$

$(a+7)(a+9) = 0$

$a = -7 \quad a = -9$

29) $\log_{20} (4n^2 - 11n) = \log_{20} (-18 + 3n^2)$

$4n^2 - 11n = -18 + 3n^2$

$n^2 - 11n + 18 = 0$

$(n-9)(n-2) = 0$

$n = 9 \quad n \neq 2$

1. A person's typing speed is modeled by the function $W = 80\left(1 - e^{-0.08t}\right)$, where W is the number of words per minute and t is the number of weeks of practice. How many words can by typed after 6 weeks of practice? Round your answer to the nearest tenth.

$$80(1-e^{-.08\cdot 6}) = 30.5$$

2. If $17,570 is invested at an interest rate of 2.38% per year, find the amount of the investment at the end of 4 years for the following compounding methods:

a. Monthly

$$17570\left(1+\frac{.0238}{12}\right)^{12\cdot 4} = 19323.05$$

b. Weekly

$$17570\left(1+\frac{.0238}{52}\right)^{52\cdot 4} = 19324.45$$

c. Quarterly

$$17570\left(1+\frac{.0238}{4}\right)^{4\cdot 4} = 19319.42$$

d. Continuously

$$17570\, e^{.0238\cdot 4} = 19324.87$$

3. Express the following in logarithmic form.

a. $16384 = 16^{\left(\frac{7}{2}\right)}$

$$\log_{16} 16384 = \frac{7}{2}$$

b. $\frac{1}{8} = 2^{-3}$

$$\log_2 \frac{1}{8} = -3$$

4. Write the equation in exponential form: $\log_a 5.6 = w$

$$a^w = 5.6$$

5. Rewrite the following expressions as a single logarithm.

a. $2\log_5 k + 3\log_5 g$ $= \log_5 k^2 + \log_5 g^3 = \log_5 k^2 g^3$

b. $2\log_2 k + 0.5\log_2 g - 4\log_2 m$

$$\log_2 k^2 + \log_2 g^{.5} - \log_2 m^4 = \log_2 \frac{k^2\sqrt{g}}{m^4}$$

6. Use the Law of Logarithms to rewrite the expressions with no product, quotient, or power.

a. $\log_x\left(d^3k^4w\right)^2$ $= 2\log_x d^3k^4w = 2(3\log_x d + 4\log_x k + \log_x w)$

$6\log_x d + 8\log_x k + 2\log_x w$

b. $\log_4\left(\frac{d^4k^6g}{m}\right)^3$ $3\log_4 \frac{d^4k^6g}{m} = 3(4\log_4 d + 6\log_4 k + \log_4 g - \log_4 m)$

$12\log_4 d + 18\log_4 k + 3\log_4 g - 3\log_4 m$

7. Solve each of the following for x. Round your answers to the nearest hundredth.

a. $15\left(4^x\right) = 750$ $4^x = 50$ $\log_4 50 = x$ $x = 2.82$

b. $13\left(e^{-2x}\right) = 620$ $e^{-2x} = \frac{620}{13}$ $\ln\frac{620}{13} = -2x$ $x = -\frac{1}{2}\ln\frac{620}{13} = -1.93$

c. $\ln(8+x) = 4$ $e^4 = 8+x$ $x = e^4 - 8 = 46.60$

d. $\log_x 5417 = 6$ $(x^6)^{1/6} = (5417)^{1/6}$

$x = 4.19$

8. Evaluate each of the following. Round your answers to the nearest hundredth.

a. $\log_{2.1} 5.89$ $\frac{\log 5.89}{\log 2.1} = 2.39$

b. $\ln 58.47$ 4.07

c. $e^{\ln 2}$ 2

State the domain, range, and asymptote of each function.

9. $f(x) = \log_4(x+3)$ Domain $x > -3$ Range $y = \mathbb{R}$ Asymptote $x = -3$

10. $f(x) = 8 - \log x$ Domain $x > 0$ Range $y = \mathbb{R}$ Asymptote $x = 0$

11. $f(x) = \log(2x-7)$ Domain $x > \frac{7}{2}$ Range $y = \mathbb{R}$ Asymptote $x = 7/2$

$2x - 7 = 0$

$x = \frac{7}{2}$

12. $f(x) = e^{3x} + 2$ Domain $x = \mathbb{R}$ Range $y > 2$ Asymptote $y = 2$