Review of Chapter 4 Logarithms

Name Key

NO CALCULATOR

Rewrite in Exponential form

1. $\log_6 37 = x$ $6^x = 37$

2. $\log x = y$ $10^y = x$

3. $\ln c = 17$ $c = e^{17}$

Rewrite in Logarithmic form

4. $2^6 = 64$ $\log_2 64 = 6$

5. $49^{\frac{-1}{2}} = \frac{1}{7}$ $\log_{49} 1/7 = -1/2$

Simplify each log (Evaluate).

6. $\log_2 128$ 2^7 7

7. $\log_8 1$ 8^0 0

8. $\log_3 \frac{1}{27}$ 3^{-3} -3

9. $\log_{10} 0.000001$ -6
10^{-6}

10. $\ln e^6$ 6

11. $\log_4 8$ $3/2$
$4^x = 8 \rightarrow 2^{2x} = 2^3$

12. $10^{\log_{10} 5}$ 5

13. $\log_5 \sqrt{5}$ $5^{1/2}$ $1/2$

"property"

Solve for x.

14. $\log_2(1-x) = 4$ -15
$1 - x = 2^4 = 16$
$-x = 15 \rightarrow x = -15$

15. $\log_8(x+5) - \log_8(x-2) = 1$ 3
$\log_8 (x^2+3x-10) = 1$ $x^2+3x-18=0$
$x^2+3x-10 = 8^1$ $(x+6)(x-3)$

16. $\log_{27} x = -\frac{4}{3}$ $1/81$
$x = 27^{-4/3} \rightarrow 3^{3 \cdot \frac{-4}{3}} = 3^{-4}$

17. $\log x + \log(x+1) = \log 20$ 4
$\log(x^2+x) = \log 20$
$x^2+x-20=0$
$(x+5)(x-4)$

18. $\log_x 27 = \frac{3}{2}$ 9
$27 = x^{3/2}$
$3^{3 \cdot 2/3} = x^{3/2 \cdot 2/3}$ $3^2 = x$

Expand

19. $\log\left(\frac{4x^3}{y^2(x-1)^5}\right)$ OR $2\log 2 + 3\log x - (2\log y + 5\log(x-1))$
$2\log 2 + 3\log x - 2\log y - 5\log(x-1)$
$\log 4x^3 - \log y^2(x-1)^5$
$\log 4 + \log x^3 - (\log y^2 + \log(x-1)^5)$

20. $\ln(AB^2C^3)$ $\ln A + 2\ln B + 3\ln C$
$\ln A + \ln B^2 + \ln C^3$

Write as a single logarithm. (Contract)

21. $\ln x - 2\ln(x^2+1) + \frac{1}{2}\ln(3-x^4)$ $\ln \frac{x\sqrt{3-x^4}}{(x^2+1)^2}$

$\ln x - \ln(x^2+1)^2 + \ln\sqrt{(3-x^4)}$

$\ln \frac{x}{(x^2+1)^2} + \ln\sqrt{3-x^4}$

Evaluate (Contract and solve)

22. $\log_5 250 - \log_5 2$ 3

$\log_5 125$ $\log_5 5^3$

23. $\log 25 + \log 4$ 2

$\log_{10} 100$ 10^2

Solve **CALCULATORS ALLOWED** (hundredth)

24. $\log_4 15$ 1.95

$\frac{\log 15}{\log 4}$

25. $8^x = 24$ 1.53

$\log_8 24 = x$ $\frac{\log 24}{\log 8}$

26. $e^{\frac{3x}{4}} = 10$ 3.07

$\frac{3x}{4} = (\ln 10)\cdot\frac{4}{3}$

27. $\log_3 \sqrt[2]{243}$ 5/2

$\log_3 3^{5/2}$

28. $\log_4 x = 5$ 1024

$x = 4^5$

29. $5^{5-3x} = 26$ -0.99

$\log_5 26 = 5 - 3x$

$\frac{(\log_5 26) - 5}{3} = x$

30. $\log_8 6 - \log_8 3 + \log_8 2$ 2/3

$\log_8 2 + \log_8 2$

$\log_8 4 = x$

$8^x = 4$

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

31. $\ln(2x-3) = 14$ 601,303.64

$2x - 3 = e^{14}$

$x = \frac{e^{14}+3}{2}$

32. $2^{1-x} = 3^{2x+5}$ -1.66

$1\log 2 - x\log 2 = 2x\log 3 + 5\log$

$\log 2 - 5\log 3 = 2x\log 3 + x\log$

$\frac{(\log 2 - 5\log 3)}{(2\log 3 + \log 2)} = x$ $= x(2\log 3 + \log 2)$

33. $12000 is invested at 10% interest and compounded monthly. Determine how much the investment is worth after 3 years.

$A = 12{,}000\left(1 + \frac{.10}{12}\right)^{(12\cdot 3)} =$ **$16,178.18**

34. $5000 is invested at 8.5% interest and compounded semiannually. How many years would it take for the investment to be worth $7000?

$7000 = 5000\left(1 + \frac{.085}{2}\right)^{2t}$

$1.4 = (1.0425)^{2t}$

$\log_{1.0425} 1.4 = 2t$

t = 4 years

35. If $12000 is invested at an interest rate of 10% per year, find the amount of the investment at the end of 3 years when compounded continuously.

$A = 12{,}000\, e^{(.10\cdot 3)} =$ **$16,198.31**

36. The stray cat population in a small town grows exponentially. In 2012 the town had 30 stray cats and the relative growth rate was 15% per year.

a) Find the projected population after 4 years.

can't have a partial ☺

$n(t) = 30e^{(.15 \cdot 4)} \approx$ **54 cats**

b) Find the number of years required for the stray cat population to reach 500.

$500 = 30e^{(.15t)}$

$\frac{\ln\left(\frac{50}{3}\right)}{.15} = t \approx 18.8$ years

37. Uranium-1234 has a half-life of 2700 years. How long will it take a 10 mg sample to decompose to 7 mg?

$1/2 = 1e^{r \cdot 2700}$

$r = \frac{\ln(.5)}{2700}$ $r = .000256721178$

$7 = 10e^{rt}$

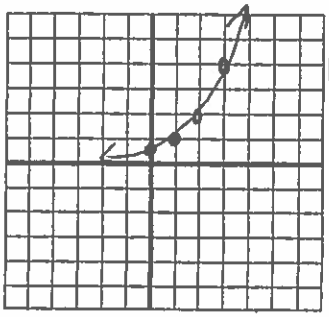
$\frac{\ln .7}{} = t =$ **1,389.3 years**

38. Graph the equation. Describe the transformation. State the Domain, Range and Asymptote.

a) $y = 2^{x-1}$

X	Y
0	1/2
1	1
2	2
3	4

D: $(-\infty, \infty)$
R: $(0, \infty)$
A: $y = 0$

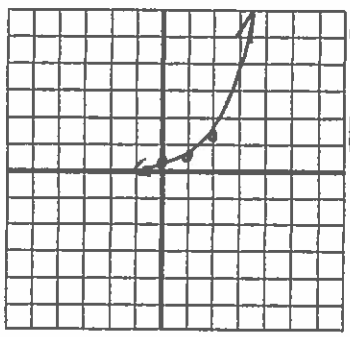


shifted → 1

b) $y = \frac{1}{2}e^{x-1}$

X	Y
0	.18394
1	.5
2	1.3591

D: $(-\infty, \infty)$
R: $(0, \infty)$
A: $y = 0$



Shrunk vert. by 1/2, shifted → 1

c) Graph $y = 2^x$ and its inverse $y^{-1} = \log_2 X$ on the same axes.

$X = 2^Y$

$\log_2 X = Y$

X	Y
-1	1/2
0	1
1	2

X	Y