Secondary Math 3
Review Chapter 6

Name: _____
Period: _____

Write each equation in logarithmic form:

1- $49^{\frac{1}{2}} = 7$

$\log_{49} 7 = \frac{1}{2}$

2- $5^{-2} = \frac{1}{25}$

$\log_5 \frac{1}{25} = -2$

Write each equation in exponential form:

3- $\log_2 32 = 5$

$2^5 = 32$

4- $\log_2 \frac{1}{16} = -4$

$2^{-4} = \frac{1}{16}$

Evaluate each expression: (Show your work)

5- $\log_2 64 = x$

$2^x = 64 \quad x = 6$

6- $\log_2 \frac{1}{8} = x$

$2^x = \frac{1}{8} \quad x = -3$

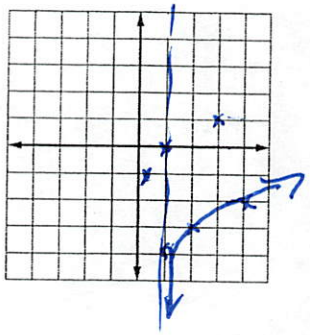
Graph each function then state the domain and range:

7- $\log_3(x-1) - 3$

$y = \log_3 x$

x	y
1/3	-1
1	0
3	1

→ 1
↓ 3



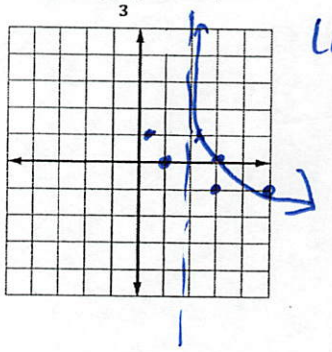
(1, ∞)
D: $x > 1$
R: $\mathbb{R}$

8- $\log_{\frac{1}{3}}(x-2)$

$\log_{\frac{1}{3}} x$

x	y
3	-1
1	0
1/3	1

→ 2



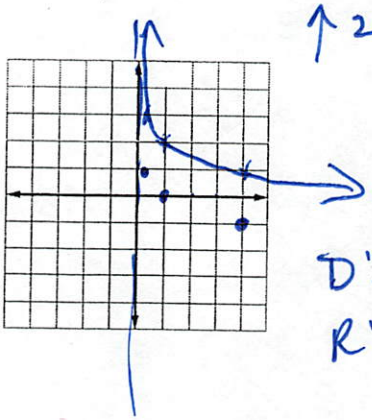
(2, ∞)
D: $x > 2$
R: $\mathbb{R}$

9- $-\log_4 x + 2$

$\log_4 x$

x	y	-y
1/4	-1	1
1	0	0
4	1	-1

↑ 2



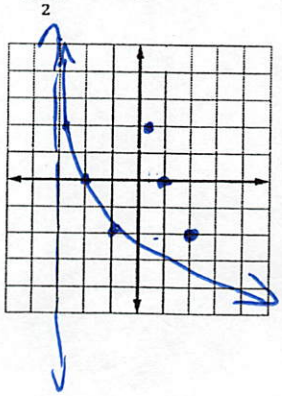
(0, ∞)
D: $x > 0$
R: $\mathbb{R}$

10- $2\log_{\frac{1}{2}}(x+3)$

$\log_{\frac{1}{2}} x$

x	y	2y
2	-1	-2
1	0	0
1/2	1	2

← 3



(3, ∞)
D: $x > -3$
R: $\mathbb{R}$

Solve each equation:

11- $log_4 x = \frac{3}{2}$

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

$x = 8$

12- $log_3 x = -2$

$3^{-2} = x$

$x = \frac{1}{9}$

13- $log_{\frac{1}{2}} x = 3$

$\frac{1}{2}^3 = x$

$x = \frac{1}{8}$

Solve each inequality:

14- $log_{27} x < \frac{2}{3}$

$x < 27^{2/3}$ $\quad 0 < x < 9$

$x < 9$; $x > 0$

15- $log_4 x > 3$

$x > 4^3$

$x > 64$

16- $log_5 x < -3$

$x < 5^{-3}$

$x < \frac{1}{125}$; $x > 0$

$0 < x < 1/125$

Solve each equation:

17- $log_3(3x + 4) = log_3(x + 9)$

$3x + 4 = x + 9$

$2x = 5$

$x = 5/2$

18- $log_5(p^2 - 2) = log_5(p)$

$p^2 - 2 = p$

$p^2 - p - 2 = 0$

$(p-2)(p-1) = 0$

$p = 2$ or $p \neq 1$

19- $log_9(3x - 1) = log_9(4x)$

$3x - 1 = 4x$

$x \neq -1$ no solution

Solve each equation:

20. $log_5 7 - \frac{1}{2} log_5 4 = log_5 x$

$log_5 7 - log_5 4^{1/2} = log_5 x$

$log_5 \frac{7}{2} = log_5 x$

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

21. $2log_2 x - log_2(x + 3) = 2$

$log_2 x^2 - log_2(x+3) = 2$

$log_2 \frac{x^2}{(x+3)} = 2$

$\frac{x^2}{x+3} = 2^2$ $\quad x^2 = 4(x+3)$

$x^2 = 4x + 12$

$x^2 - 4x - 12 = 0$

$(x-6)(x+2) = 0$

$x = 6$ or $x \neq -2$

22. $log_{10} n + log_{10}(n + 21) = 2$

$log_{10} n(n+21) = 2$

$n^2 + 21n = 10^2$

$n^2 + 21n - 100 = 0$

$(n+25)(n-4) = 0$

$n \neq -25$, $n = 4$

Solve each equation (round each answer to the nearest hundredth):

23. $3^x = 15$

$\log_3 3^x = \log_3 15$

$x = \frac{\log 15}{\log 3} \approx 2.46$

24. $6^{x^2} = 28$

$\log_6 6^{x^2} = \log_6 28$

$x^2 = \frac{\log 28}{\log 6}$

$x \approx \pm 1.36$

25. $12^{n-1} = 72$

$\log_{12} 12^{n-1} = \log_{12} 72$

$n-1 = \frac{\log 72}{\log 12}$

$n \approx 2.72$

Solve each inequality (round each answer to the nearest hundredth):

26. $5^x \geq 42$

$\log_5 5^x \geq \log_5 42$

$x \geq \frac{\log 42}{\log 5}$

$x \geq 2.32$

27. $5^{x+2} < 3$

$\log_5 5^{x+2} < \log_5 3$

$x+2 < \frac{\log 3}{\log 5}$

$x < -1.32$

Express each logarithm in **terms of a common logarithm**. Then approximate to the nearest hundredth.

28. $2\log_5 7$

$2\left(\frac{\log 7}{\log 5}\right) \approx 2.42$

or $\frac{\log 7^2}{\log 5} = \frac{\log 49}{\log 5} = 2.42$

29. $\log_8 0.5$

$\frac{\log 0.5}{\log 8} \approx -.33$

30. $\log_{\frac{2}{3}} 64$

$\frac{\log 64}{\log \frac{2}{3}} \approx -10.26$

Write an equivalent exponential or logarithmic function:

31. $e^x = 30$

$x = \ln 30$

32. $\ln 18 = x$

$18 = e^x$

33. $\ln x = 42$

$x = e^{42}$

34. $2\ln 9 = x$

$\ln 9^2 = x$

$9^2 = e^x$

$81 = e^x$

Write as a single logarithm:

35. $3\ln 2 + 2\ln 5$

$\ln 2^3 + \ln 5^2$

$\ln 8 + \ln 25$

$\ln 200$

36. $5\ln 3 - 2\ln 9$

$\ln 3^5 - \ln 9^2$

$\ln \frac{3^5}{9^2}$

$\ln 3$

Solve each equation:

37. $4e^x - 11 = 17$

$4e^x = 28$

$e^x = 7$

$x \approx 1.95$

38. $2e^{-x} + 1 = 15$

$2e^{-x} = 14$

$e^{-x} = 7$

$-x = \ln 7$

$x \approx -1.95$

39. $\ln x + 2 = 6$

$\ln x = 4$

$x = e^4$

$x \approx 54.6$

40. $\ln x - \ln 3 = 8$

$\ln \frac{x}{3} = 8$

$\frac{x}{3} = e^8$

$x \approx 8942.87$

Solve each inequality:

41. $5 + e^{-x} > 14$

$e^{-x} > 9$

$-x > \ln 9$

$x < -\ln 9$

$x < -2.2$

42. $\ln(x-2)^3 > 15$

$3\ln(x-2) > 15$

$\ln(x-2) > 5$

$x - 2 > e^5$

$x > 150.41$

43. A particular compound decays according to the equation $y = ae^{-0.0974t}$ where t is in days. Find the half-life of the compound.

$\frac{1}{2} = e^{-.0974t}$

$\ln\left(\frac{1}{2}\right) = -.0974t$

about 7 days

44. Lydia bought a car for \$20,000. It is expected to depreciate at a continuous rate. What will be the value of the car in 2 years? Use $k = -0.105$ *and equation* $y = ae^{kt}$

$y = 20{,}000e^{-0.105(2)}$

\$16211.68

45. The Richardson family bought a house 12 years ago for \$95,000. The house is now worth \$167,000. Assuming a steady growth, what was the yearly rate of appreciation (k-value)?

$167{,}000 = 95{,}000e^{k(12)}$

$\frac{167}{95} = e^{12k}$

about 0.047