

Name _____

Date _____

Alg II - Pd _____

Q4 Test 3

LOGARITHM TEST REVIEW

Graph each of the following.

1. $y = \log_4 x$

2. $f(x) = \log_{\frac{1}{3}} x$

* Know series point
the graphs

Find the inverse of each of the following.

3. $y = 7^x$

4. $f(x) = \log_9 x$

5. $y = \left(\frac{1}{9}\right)^x$

6. $f(x) = \log_w x$

7. $y = z^x$

Write the exponential equation in logarithmic form.

8. $3^4 = 81$

9. $4^{-3} = \frac{1}{16}$

10. $9^{\frac{3}{2}} = 27$

11. $a^b = 12$

12. $16^{\frac{-1}{2}} = \frac{1}{4}$

13. $7^{\frac{1}{2}} = \sqrt{7}$

14. $m^n = p$

Write the logarithmic equation in exponential form.

15. $\log_3 9 = 2$

16. $\log_5 25 = \frac{1}{2}$

17. $\log_x y = 4$

18. $\log_8 4 = \frac{2}{3}$

19. $\log_b \frac{1}{b^2} = -2$

20. $\log_{11} \sqrt{11} = \frac{1}{2}$

21. $\log_a b = c$

Solve each equation.

22. $\log_3 x = 2$

23. $\log_x 16 = 4$

24. $\log_4 x = -2$

25. $\log_8 32 = x$

26. $\log_{64} \frac{1}{8} = y$

27. $\log_x \sqrt{2} = \frac{1}{4}$

28. $\log_{\frac{1}{2}} 8 = y$

29. $\log_{16} (3x+1) = \frac{1}{2}$

30. $\log_{\frac{1}{3}} (4x+7) = -2$

31. $\log_3 (2y-3) = \log_3 (y+6)$

32. $\log_5 (x^2 - 2) = \log_5 (10x - 18)$

33. $\log_2 (x^2 - 14x) = 5$

Use the laws of logarithms to expand each expression.

34. $\log_3 mn$

35. $\log_4 a^3 b$

36. $\log_{\frac{1}{2}} (ab)^3$

37. $\log_7 \sqrt{xy}$

38. $\log_3 \frac{\sqrt{m}}{n}$

39. $\log_2 \frac{x^5}{y^3}$

40. $\log_6 \left(\frac{x}{y}\right)^4$

41. $\log_5 \sqrt[4]{x}$

42. $\log a^3 b \sqrt{c}$

43. $\log 2a^3 b$

Use the laws of logarithms to rewrite as a single logarithm.

44. $\log p + \log q$

45. $4 \log b$

46. $2 \log a + 3 \log b$

47. $\log a - 3 \log b$

48. $3(\log a - \log b)$

49. $\frac{1}{3} \log a - 6 \log b$

50. $\log a + 4 \log b - 2 \log c$

Solve each equation.

51. $\log_4 8 + \log_4 3 = \log_4 6x$

52. $2 \log 5 = \log n$

53. $\log x - \log \frac{1}{4} = \log 20$

54. $\log_7 x = 3 \log_7 2$

55. $4 \log_5 x - \log_5 4 = \log_5 4$

56. $\log_4 (x + 3) + \log_4 (x - 3) = 2$

57. $\log_7 x = \frac{1}{2} \log_7 144 - \frac{1}{3} \log_7 8$

58. $\log_5 (x + 3) - \log_5 x = \log_5 4$

Evaluate each of the following to the nearest ten-thousandth.

59. $\log_2 15$

60. $\log_7 21$

61. $\log_3 5$

Solve for x to the nearest hundredth.

62. $3^x = 39$

63. $287 = 4^x$

64. $7^x + 3 = 20$

65. $3^{2x+1} = 54$

66. $5^{3x} = 263$

67. $4^{3x-2} = 801$

68. $4^x = 1.87$

69. $5^{2x} = 3^{4x-1}$

70. $4^x = 6^{3x+7}$

Rewrite each expression in log form.

71. $e^5 \approx 148.413$

72. $e^{3.2} \approx 24.533$

73. $e^{(-1/2)} \approx 0.607$

Solve for x to the nearest hundredth.

74. $4.21 + 6.7e^{0.14x} = 783.23$

75. $11 + 5e^{0.24x} = 16.578$

76. $5e^x = 5$

77. $4e^{2x} = 5$

78. $\ln x + \ln 1 = 5$

79. $5 + 2 \ln x = 4$

80. $6 \ln 4x - 1 = 14$

81. In 2005, your great-aunt Marguerite retired after forty years of service to a Wall Street firm and received a retirement bonus of \$500,000. Because of the large sum, she was able to invest it at an annual rate of 7.25% compounded continuously. Use the formula $A = Pe^{rt}$ to determine in how many years, to the nearest tenth of a year, will your great-aunt's money have doubled?

82. Mouthwash manufacturers are constantly testing various chemicals on bacteria that thrive on human saliva. The death of the bacteria exposed to Antigen 223 can be represented by the function $P(t) = 2,000e^{-0.37t}$ where $P(t)$ represents the number of bacteria from a population of 2,000 surviving after t minutes. Determine the number of minutes, to the nearest tenth of a minute, necessary to kill 1800 bacteria.

83. Nurse Hatchet administers 150 milligrams of medication to a patient at 8 am. The amount of medication, a , remaining in a patient's bloodstream t hours after it has been administered is given by the formula $a = 150e^{-0.4895t}$. If the next dose of medication is not given until less than 25 milligrams remain in the body, determine, to the nearest tenth of an hour, in how many hours the patient will receive his next medication.

84. Americans have been steadily increasing their usage of bottled water. In fact, between 1987 and 1996, our use of bottled water doubled. The yearly usage of water, in billions, can be represented by the function $y = 1.55(1.08006)^t$, where t represents the number of years since 1987. If Americans continue to prefer bottled water at a similar rate, in what year will sales top 100 billion gallons of water?

85. Your new 2009 Expedition depreciates at a rate of 18% per year. If you purchased the truck for \$39,389, when will the car be worth less than \$5,000?

ANSWER KEY

$$y = \log_4 x$$

x	y
1	0
2	.5
4	1
16	2

$$y = \log_{1/5} x$$

x	y
1	0
3	-1
9	-2
27	-3

3. $y^{-1} = \log_7 x$

4. $f^{-1}(x) = 9^x$

5. $y^{-1} = \log_{1/9} x$

6. $f^{-1}(x) = w^x$

7. $y^{-1} = \log_z x$

8. $4 = \log_3 81$

9. $-3 = \log_4 \frac{1}{16}$

10. $\frac{3}{2} = \log_9 27$

11. $b = \log_a 12$

12. $\frac{-1}{2} = \log_{16} \frac{1}{4}$

13. $\frac{1}{2} = \log_7 \sqrt{7}$

14. $n = \log_m p$

15. $3^2 = 9$

16. $5^{\frac{1}{2}} = 25$

17. $x^4 = y$

18. $8^{\frac{2}{3}} = 4$

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

20. $11^{\frac{1}{2}} = \sqrt{11}$

21. $a^c = b$

22. $x = 9$

23. $x = 2$

24. $x = \frac{1}{16}$

25. $x = \frac{5}{3}$

26. $y = \frac{-1}{2}$

27. $x = 4$

28. $y = -3$

29. $x = 1$

30. $x = \frac{1}{2}$

31. $y = 9$

32. $x = 8$ or $x = 2$

33. $x = -2$ or $x = 16$

34. $\log_3 m + \log_3 n$

35. $3 \log_4 a + \log_4 b$

36. $3 \log_{\frac{1}{2}} a + 3 \log_{\frac{1}{2}} b$

37. $\frac{1}{2} \log_7 x + \log_7 y$

38. $\frac{1}{2} \log_3 m - \log_3 n$

39. $5 \log_2 x - 3 \log_2 y$

40. $4 \log_6 x - 4 \log_6 y$

41. $\frac{1}{4} \log_5 x$

42. $3 \log a + \log b + \frac{1}{2} \log c$

43. $\log 2 + 3 \log a + \log b$

44. $\log pq$

45. $\log b^4$

46. $\log a^2 b^3$

47. $\log \frac{a}{b^3}$

48. $\log \left(\frac{a}{b} \right)^3$ or $\log \frac{a^3}{b^3}$

49. $\log \frac{\sqrt[3]{a}}{b^6}$

50. $\log \frac{ab^4}{c^2}$

51. $x = 4$

52. $n = 25$

53. $x = 5$

54. $x = 8$

55. $x = 2$

56. $x = 5$

57. $x = 6$

58. $x = 1$

59. 3.9069

60. 1.5646

61. 1.4650

62. $x = 3.33$

63. $x = 4.08$

64. $x = 1.46$

65. $x = 1.32$

66. $x = 1.15$

67. $x = 2.27$

68. $x = .45$

69. $x = .93$

70. $x = -3.14$

71. $5 \approx \ln 148.413$

72. $3.2 \approx \ln 24.533$

73. $-1/2 \approx \ln 0.607$

74. $x = 33.97$

75. $x = .46$

76. $x = 0$

77. $x = .11$

78. $x = 148.41$

79. $x = .61$

80. $x = 3.05$

81. $t = 9.6$ years

82. $t = 6.2$

83. $t = 3.7$

84. year 55 = 2042

85. year 10; 2019