Logs and Exponents Homework Booklet

1. Change to logarithmic form: $p = q^r$

   A. $\log_p q = r$ B. $\log_q p = r$ C. $\log_r p = q$ D. $\log_q r = p$

2. Evaluate: $\log_2 7.5$

   A. 0.44 B. 0.57 C. 2.26 D. 2.91

3. Determine the range of the function $y = 2^{x-3} + 4$.

   A. y > 4 B. y > –4 C. y > 3 D. y > –3

4. Solve: $16^{x+1} = 8^{1-x}$

   A. $-\frac{1}{3}$ B. $-\frac{1}{7}$ C. $\frac{2}{7}$ D. $\frac{2}{5}$

5. Which expression is equivalent to $\log\left(\frac{100x^3}{y}\right)$?

A. $2 + \log(3x - y)$ B. $300 \log x - \log y$ C. $2 + 3\log x - \log y$ D. $\log(100 + x^3 - y)$

6. Solve: $\log_3(x+4) + \log_3(6-x) = 2$

   A. 3 B. 5 C. 3, –5 D. 5, –3

7. Simplify: $a^{\log_a 8 + \log_a 2}$

   A. 10 B. 16 C. a^{10} D. a^{16}

8. Change $y = \log_7 x$ to exponential form.

   A. $y = x^7$ B. $y = 7^x$ C. $x = y^7$ D. $x = 7^y$

9. What is the domain of $y = \log_3(4x-1) + 3$?

   A. $x > 0$ B. $x > 1$ C. $x > \frac{1}{4}$ D. all real numbers

10. Simplify the expression: $\log_a\left(\frac{1}{a^b}\right)$

    A. $-b$ B. b C. a^b D. a^{-b}

11. The intensity of light is reduced by 2% for each metre that a diver descends below the surface of the water. At what depth is the intensity of light only 10% of that at the surface?
A. 5 m B. 18 m C. 98 m D. 114 m

12. Solve for x: $5^{x-1} = 125^{3-x}$
A. 2 B. 5 C. $\frac{2}{5}$ D. $\frac{5}{2}$

13. In chemistry, the pH scale measures the acidity (0 – 7) or alkalinity (7 – 14) of a solution. It is a logarithmic scale in base 10. Thus, a pH of 9 is 10 times more alkaline that a pH of 8. If a solution has a pH of 7.6, how many times more alkaline is it than neutral water, which has a pH of 7?
A. 0.6 B. 1.09 C. 3.98 D. 12.18

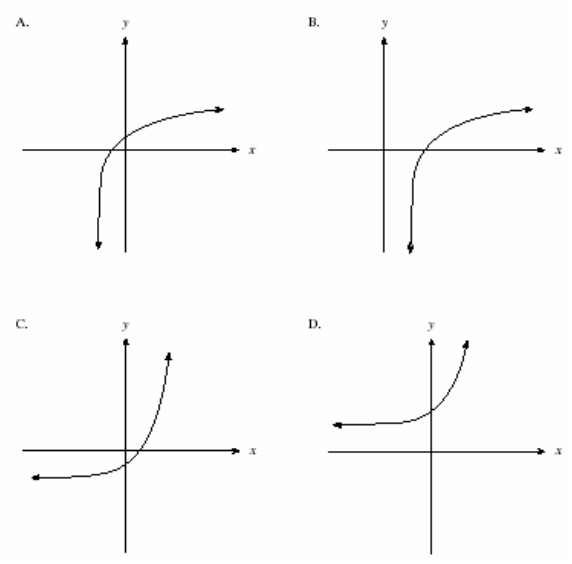
14. Determine the logarithmic form of $a = b^c$
A. $\log_a b = c$ B. $\log_a c = b$ C. $\log_c a = b$ D. $\log_b a = c$

15. A recent earthquake in Turkey measured 7.2 on the Richter scale. In 1960, the earthquake in Morocco measured 5.8. How many times more intense was the earthquake in Turkey compared to the Moroccan quake?
A. 1.24 B. 1.4 C. 17.43 D. 25.12

16. Solve: $\left(\frac{1}{4}\right)^{1-2x} = 8^{x-3}$
A. –7 B. $\frac{11}{7}$ C. $\frac{7}{4}$ D. no solution

17. If the graph of $y = \log_a x$ goes through the point (1024, 5), determine a.
A. 4 B. 4.31 C. 10 D. 204.8

18. Which graph best represents the function $y = \log_2(x-2)$?



19. A sample of water contains 200 g of pollutants. Each time the sample is passed through a filter, 20% of its pollutants are removed. Determine an expression that gives the number of grams of pollutants still in the water after it passes through five filters.

A. $200(0.8)^4$ B. $200(1.2)^4$ C. $200(0.8)^5$ D. $200(1.2)^5$

20. If $\log_a x = 3$ and $\log_a y = 4$, evaluate $\left(\log_a \frac{1}{xy}\right)^2$.

A. $\frac{1}{49}$ B. 1 C. 14 D. 49

21. Change $\log_4 c = x$ to exponential form.

A. $x^4 = c$ B. $4^x = c$ C. $4^c = x$ D. $c^x = 4$

22. Determine the domain of $y = 2\log_4(x-1)+5$.

A. $x > 1$ B. $x > 4$ C. $x > 5$ D. all real numbers

23. Solve: $25^{x+3} = 125^{2x-1}$

A. $-\frac{16}{3}$ B. 1 C. $\frac{11}{8}$ D. $\frac{9}{4}$

24. Solve: $\log_4(x^2+1) - \log_4 6 = \log_4 5$

A. $\sqrt{10}$ B. $\pm\sqrt{10}$ C. $\sqrt{29}$ D. $\pm\sqrt{29}$

25. Determine the x-intercept of $y = \log_2(x+4)+1$.

A. –3 B. –3.5 C. –3.9 D. –4

26. Max invests at an interest rate of 6% per annum, compounded monthly. Which expression represents the amount of Max's investment after *t* years?

A. $5000(1.06)^{12t}$ B. $5000(1.005)^{12t}$ C. $5000(1.06)^t$ D. $5000(1.005)^{\frac{t}{12}}$

27. Which expression is equivalent to $\log(m^2n)^3$?

A. $6\log m + 3\log n$ B. $6\log m + \log n$ C. $(2\log m + \log n)^3$ D. $\log 3m^2 + \log 3n$

28. Evaluate: $\log_{5.3} 210$

A. 0.31 B. 1.60 C. 2.31 D. 3.21

29. Solve: $27^{x+2} = \left(\frac{1}{3}\right)^{3-6x}$

A. $-\frac{1}{3}$ B. $\frac{1}{7}$ C. $\frac{5}{3}$ D. 3

30. Determine the equation of the asymptote of $f(x) = 2^{x-1} + 3$.

A. $y = 2$ B. $y = -2$ C. $y = 3$ D. $y = -3$

31. The pH scale is a logarithmic scale. If bleach has a pH of 13, how many times more alkaline is it than blood which has a pH of 8?

A. 1.625 B. 5 C. 50 D. 100 000

32. If $\log_3(m+n) = 2,\ (m+n) > 0$, express *m* in terms of *n*.

A. $m = 9 - n$ B. $m = 6 - n$ C. $m = \frac{9}{n}$ D. $m = \frac{6}{n}$

33. If $B = \frac{A}{C^2}$, determine an expression for log *B*.

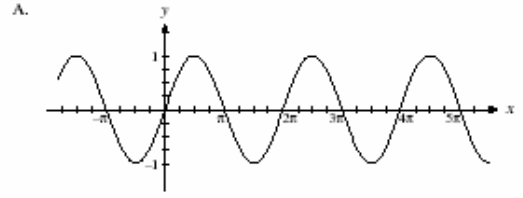
A. $\log A - 2\log C$ B. $\log A - \log 2C$ C. $\frac{\log A}{2\log C}$ D. $\frac{\log A - \log C}{2}$

34. A radioactive substance decays continuously according to the formula $N = Ce^{kt}$. If 50 grams of the substance decays to 20 grams in 10 years, determine the value of *k*.

A. –0.0916 B –0.0398 C 0.0610 D 0.0916

35. Which graph best represents the function $\log y = \log(\sin x)$?

A.



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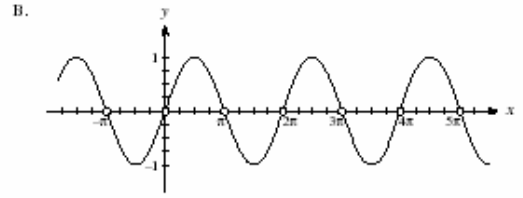

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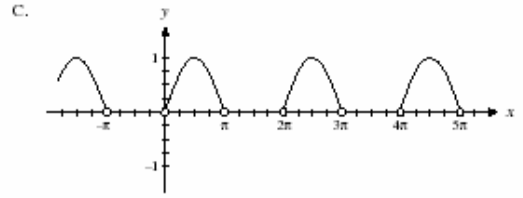

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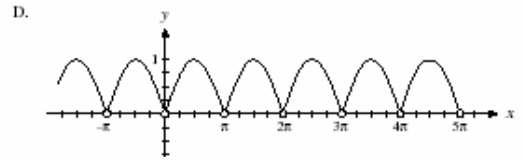


36. Determine an equivalent expression for $\log P - \log Q$.

A. $\log(P-Q)$ B. $\log PQ$ C. $\log\frac{P}{Q}$ D. $\frac{\log P}{\log Q}$

37. Determine an equation of the asymptote of $y = 2\log_3(x+4)-5$.

A. $x = -5$ B. $x = -4$ C. $y = -5$ D. $y = -4$

38. Solve: $\log_5(x-3) = 2$

A. 5 B. 13 C. 28 D. 35

39. Atmospheric pressure varies with altitude above the surface of the earth. For altitudes up to 10 km, the pressure, *p*, in kilopascals, is given by $p = 100e^{-0.139a}$, where *a* is the altitude in km. What would the pressure be at 5 km above the surface of the earth? (answer to the nearest kilopascal.)

A. 22 B. 50 C. 93 D. 200

40. Solve for *x*: $\left(\sqrt{a}\right)^{6x-2} = \left(a^2\right)^{2x+3}$

A. –7 B. –4 C. –5 D. 4

41. The half-life of Iodine-126 is 13 days. Calculate the length of time, in days, that it will take for 100 g of Iodine-126 to decay to 15 g.

A. 4.75 B. 9.00 C. 34.34 D. 35.58

42. If $\log c = 3$, evaluate $\log 10c^2$.

A. 6 B. 7 C. 8 D. 10

43. If *x* is an angle in standard position, in which quadrants is the expression $\log(\cos x)$ defined?

A. 1 and 2 B. 1 and 4 C. 2 and 3 D. 3 and 4

44. Change to exponential form: $\log_k l = m$

$A. l = m^k$ $B. l = k^m$ $C. k = m^l$ $D. k = l^m$

45. Determine the domain of the function $y = \log(2x+3)$

$A. x > -\frac{3}{2}$ $B. x > -\frac{2}{3}$ $C. x > \frac{2}{3}$ $D. x > \frac{3}{2}$

46.
A recent earthquake in Washington measured 6.3 on the Richter scale. In 1964, the Alaskan earthquake measured 8.5. How many times as intense was the 1964 Alaskan earthquake compared to the recent Washington earthquake?

A. 1.35 B. 2.2 C. $10^{1.36}$ D. $10^{2.2}$

47. Solve for x: $\log_3(x-6)+\log_3 x=3$

A. 4.5 B. 9 C. 16.5 D. –3, 9

48. Solve for x: $81^{x-1}=\left(\frac{1}{27}\right)^{x-4}$

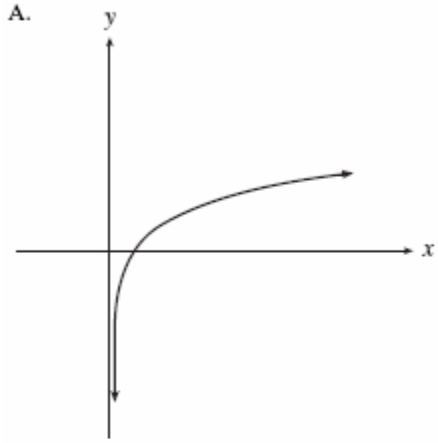
A. –8 B. –3 C. $-\frac{3}{7}$ D. $\frac{16}{7}$

49. Solve for x in terms of $\log a$, $\log b$, and $\log c$: $ab^x=c$

$A.\ x=\frac{\log c}{\log a+\log b}$ $B.x=\frac{\log c+\log a}{\log b}$ $C.x=\frac{\log c-\log a}{\log b}$ $D.x=\frac{\log c}{\log b}-\log a$

50.
If $0<a<1$, which of the following is the best graph of $y=\log_a x$?

A.



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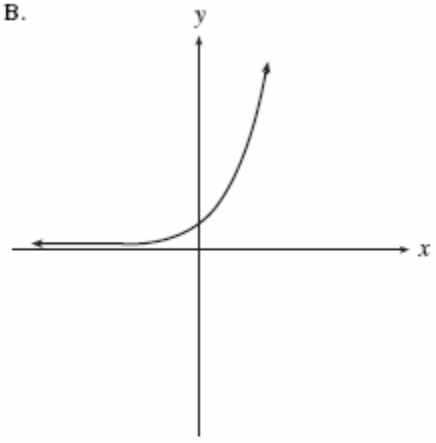

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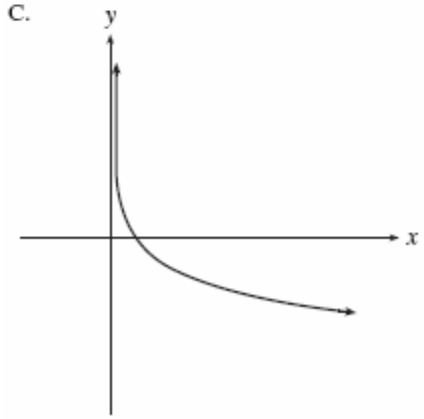

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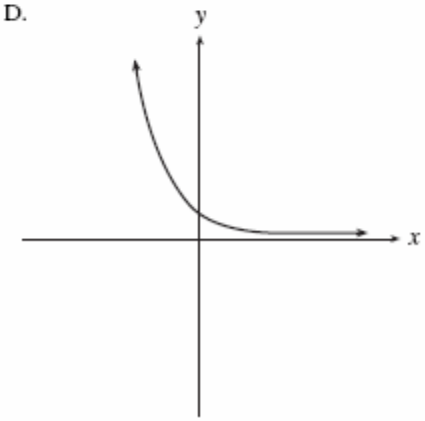

Written Questions:

1. Strontium-90 is a radioactive substance with a half-life of 28 days. How many days will it take for a 200 gram sample of strontium-90 to be reduced to 8 grams? (Solve algebraically using logarithms.)

2. Solve algebraically: $\log_2(2-2x)+\log_2(1-x)=5$

3. A biologist determines that a particular type of bacteria grows continuously according to the formula $P=P_0e^{kt}$. Determine the value of the continuous growth rate, *k*, if the population of the bacteria increases from 500 to 1500 in 8 days.

4. Solve algebraically: $\log_2 x+\log_2(x-7)=3$

5. A radioactive substance is produced from nuclear fallout. If 250 g of this substance decays to 150 g in 30 years, what is the half-life of this substance? (Solve algebraically using logarithms. Answer accurate to at least 2 decimal places.)

6. Solve algebraically: $2\log(3-x) = \log 4 + \log(6-x)$

7. Solve algebraically: $\log_2 x = 3 - \log_2(x+2)$

8. If 3150mg of a radioactive substance decays to 450mg in 73 weeks, determine the half-life of the substance to the nearest week (solve algebraically using logarithms)

Key

1. B	2. D	3. A	4. B	5. C	6. D	7. B	8. D	9. C
10. A	11. D	12. D	13. C	14. D	15. D	16. A	17. A	18. B
19. C	20. D	21. B	22. A	23. D	24. D	25. B	26. B	27. A
28. D	29. D	30. C	31. D	32. A	33. A	34. A	35. C	36. C
37. B	38. C	39. B	40. A	41. D	42. B	43. B	44. B	45. A
46. D	47. B	48. D	49. C	50. C				

1) 130 days	2) x = -3	3) k = 0.137	4) x = 8
5) 40.71 years	6) x = -3	7) x = 2	8) 26 weeks