

Chapter 7 Chapter Test

Form G

Do you know HOW?

Solve each equation.

1. $8 - 3^x = -1$
 $x = 2$

2. $\log_3 81 = x$ $x = 2$

3. $\log x - \log 3 = 2 \rightarrow \log \frac{x}{3} = 2$

4. You put \$2000 into an account earning 4% interest compounded continuously. Find the amount in the account at the end of 8 years.

$3 \cdot 10^2 = \frac{x}{3} \cdot 3$

$300 = x$

Describe how the graph of each function is related to the graph of its parent function.

5. $y = -2^x + 1$ → Reflect on x-axis
 → Translate up 1 unit.

6. $y = 3^{x-4}$ → Translate right 4 units.

7. $y = 5^{x+1} - 2$ → Translate left 1 unit.
 down 2 units.

Evaluate each logarithm.

8. $\log_5 125$

$5^x = 125$
 $5^x = 5^3$
 $x = 3$

9. $\log_{\frac{1}{2}} \frac{1}{4}$

$(\frac{1}{2})^x = \frac{1}{4}$
 $(2^{-1})^x = \frac{1}{2^2}$
 $2^{-1x} = 2^{-2} \rightarrow -1x = -2$
 $x = 2$

10. $\log_3 729$

$3^x = 729$
 $3^x = 3^6 \Rightarrow x = 6$

11. $\log_9 \frac{1}{3}$

$9^x = \frac{1}{3}$
 $3^{2x} = 3^{-1}$
 $2x = -1$
 $x = -\frac{1}{2}$

12. $\log_{\frac{1}{4}} 16$

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

13. $\log_8 \frac{1}{256}$

$8^x = \frac{1}{256}$
 $2^{3x} = \frac{1}{2^8}$
 $2^{3x} = 2^{-8}$
 $\frac{3x}{3} = \frac{-8}{3}$
 $x = -\frac{8}{3}$

Write each equation in logarithmic form.

14. $7^3 = 343$
 $\log_7 343 = 3$

15. $(\frac{2}{3})^{-3} = \frac{27}{8}$
 $\log_{\frac{2}{3}} \frac{27}{8} = -3$

16. $2^{-4} = 0.0625$
 $\log_2 0.0625 = -4$

Write each logarithmic expression as a single logarithm.

17. $\log 2 - 3 \log 13$
 $\log 2 - \log 13^3$
 $\log \frac{2}{13^3}$
 $\log 2$

18. $\log a - \log ab$
 $\log \frac{a}{ab}$
 $\log \frac{1}{b}$

19. $\frac{1}{3}(\log_4 x + \log_4 z)$
 $\frac{1}{3} \log_4 x + \frac{1}{3} \log_4 z$
 $\log_4 x^{\frac{1}{3}} + \log_4 z^{\frac{1}{3}}$
 $\log_4 x^{\frac{1}{3}} z^{\frac{1}{3}}$

Chapter 7 Chapter Test (continued)

Form G

Use the Change of Base Formula to rewrite each expression using common logarithms.

20. $\log_4 12 = \frac{\log 12}{\log 4}$

21. $\log_2 5 = \frac{\log 5}{\log 2}$

22. $\log_8 14 = \frac{\log 14}{\log 8}$

23. A parent increases a child's allowance by 15% each year. If the allowance is \$3 now, when will it reach \$15?

$A(t) = a(1+r)^t$
 $15 = 3(1+0.15)^t$
 $\frac{15}{3} = \frac{3(1.15)^t}{3}$
 $5 = (1.15)^t$
 $\log_{1.15} 5 = t$
 $t = \frac{\log 5}{\log 1.15}$
 $\approx 11.5 \text{ years}$

24. A scientist notes that the number of bacteria in a colony is 50. Two hours later, she notes that the number of bacteria has increased to 80. If this rate of growth continues, how much more time will it take for the number of bacteria to reach 100?

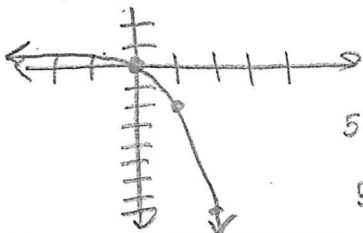
See bottom of paper
 0.95 hours
 asymptote $x=0$
 D: $x > 0$

Graph each function.

25. $y = -3^x + 1$

D: ARN
 R: $y > 1$
 asymptote: $y = 0$

x	y
0	0
1	-2
2	-8

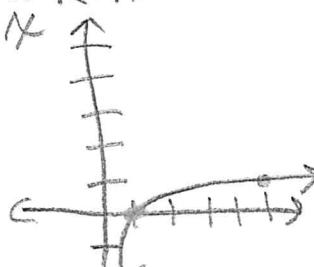


Do you UNDERSTAND?

26. $y = \log_5 x$

D: $x > 0$
 R: ARN

x	y
5 ⁰ = 1	0
5 ¹ = 5	1

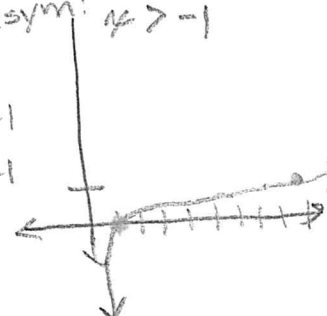


27. $y = \log(x+1)$

D: $x > -1$
 R: ARN

x	y
0	0
9	1

asymptote: $x > -1$



28. Writing Describe the effect of different values of a on the function $y = ab^x$.

$a < 0$ Reflect on x-axis
 $0 < |a| < 1$ vertical compressed
 $|a| > 1$ vertically stretched

29. Vocabulary State which property or properties need to be used to write each expression as a single logarithm.

a. $\log_6 16 - \log_6 4$

$\log_6 \frac{16}{4} = \log_6 4$

b. $2\log_2 3 + \log_2 4$

$\log_2 3^2 + \log_2 4 = \log 3^2 \cdot 4 = \log 36$

30. Reasoning Identify each function as linear, quadratic, or exponential. Explain your reasoning.

a. $y = 4(2)^x$ → Exponential. Exponent is the variable.

b. $y = 6(x)^2 + 1$ → Quadratic. Exponent is 2, not x.

31. Writing Explain the difference between exponential growth and exponential decay.

growth $b > 1$
 decay $0 < b < 1$

#24 $A(t) = a(1+r)^t$
 $a = 50$
 $t = 2$
 $A = 80$
 $r = ?$

$\frac{80}{50} = \frac{50(1+r)^2}{50}$
 $\frac{8}{5} = (1+r)^2$
 $\pm \sqrt{\frac{8}{5}} = \sqrt{(1+r)^2}$

$\frac{8}{5} = 1+r$
 -1
 $r = -1 + \sqrt{\frac{8}{5}} \approx 0.265$
 $-1 - \sqrt{\frac{8}{5}} \approx -2.265$

$r = 0.265$

$100 = 50(1.265)^t$
 $\frac{100}{50} = \frac{50(1.265)^t}{50}$
 $2 = 1.265^t$
 $\log_{1.265} 2 = t = \frac{\log 2}{\log 1.265}$

$a = 50$
 $r = .265$
 $t = ?$
 $A = 100$