

5.4 Solving Logarithmic Equations

2023-2024

Name _____ Date _____ Period _____

Find the exact solution algebraically and check it by substituting it into the original equation. Show work!

1. $32\left(\frac{1}{4}\right)^{x/3} = 2$

2. $2 \cdot 5^{x/4} = 250$

3. $3(5^{-x/4}) = 15$

4. $\log_2 x = 5$

5. $\log x = 3$

6. $\log_4(x-5) = -1$

Solve each equation. Find the exact answer and the decimal approximation. If necessary, obtain a numerical approximation for your solution by rounding to the nearest ten thousandths. Write your restrictions. Check your solution by substituting into the original equation or looking at the domain. Show work!

7. $1.08^x = 6.45$

8. $0.95^x = 1.3$

9. $40e^{0.025x} = 200$

10. $3 + 2e^{-x} = 11$

11. $7 - 4e^{-x} = -5$

12. $4e^{(x+1)} = 5$

$$13. 3^x = 25$$

$$14. 5^{x+3} = 30$$

$$15. 4^{5-x} - 2 = 13$$

$$16. 9^{(x-4)} + 2 = 5$$

$$17. \ln x^2 = 6$$

$$18. \log x^2 = 4$$

$$19. \log_3(x+2) = 2$$

$$20. 3\ln(x-2) + 6 = 7$$

$$21. 3 - \log(x+3) = 4$$

$$22. \log_3 x = \log_3 7$$

$$23. \log_5 x = \log_5(2x - 3)$$

$$24. \log_3(3x - 2) = 3$$

$$25. \log_2(x+2) + \log_2(x+4) = 3$$

$$26. \log_{10} x + \log_{10}(x + 21) = 2$$

$$27. \log_3(5x + 5) - \log_3(x^2 - 1) = 0$$

$$28. 2\log_3(x+4) - \log_3 9 = 2$$

$$29. 5\log_3(x + 1) - \log_3 27 = 2$$

$$30. 3\log_2(x - 4) + \log_2 32 = 17$$

$$31. \log_9 5 + \log_9(n + 1) = \log_9 6n$$

$$32. \log_3 2 + \log_3 8 = \log_3 2x$$

$$33. \log_5 42 - \log_5 7 = \log_5(3x - 1)$$

34. The value of a Honda Civic DX that is t years old can be modeled by $V(t) = 16,775(0.905)^t$. According to the model, when will the car be worth \$15,000? \$8,000? \$4,000? Show work!

Review: Solve the given equations. Show all work!

$$35. x^2 - 7x - 30 = 0$$

$$36. \frac{x}{x-2} - \frac{3}{x+4} = 2$$