

EXTRA PRACTICE 36
Solving Exponential and Logarithmic Equations
Use after Section 12.6

Name _____

Examples. Solve.

a) $7^{x-1} = 343$
 $7^{x-1} = 7^3$
 $x - 1 = 3$
 $x = 4$

b) $6^x = 15$
 $\log 6^x = \log 15$
 $x \log 6 = \log 15$
 $x = \frac{\log 15}{\log 6}$
 $x \approx \frac{1.1761}{0.7782}$
 $x \approx 1.5113$

c) $e^{-3t} = 0.04$
 $\ln e^{-3t} = \ln 0.04$
 $-3t \ln e = \ln 0.04$
 $-3t = \ln 0.04$
 $t = \frac{\ln 0.04}{-3}$
 $t \approx \frac{-3.2189}{-3}$
 $t \approx 1.073$

Solve.

1. $3^{5x} = 81$ _____

2. $e^{4t} = 120$ _____

3. $4^x = 6$ _____

4. $6^x = 2$ _____

5. $e^{-2t} = 0.6$ _____

6. $5^{3x+2} = 625$ _____

7. $8^{x+1} = 16$ _____

8. $10^x = 7$ _____

9. $7^x = 1520$ _____

10. $e^{0.04t} = 10$ _____

11. $e^{5t} = 5$ _____

12. $6^x = 7.1$ _____

13. $6^{x+3} = 36$ _____

14. $4^{x-1} = 3$ _____

15. $12^{2x-3} = 16$ _____

16. $10^{5-x} = 1000$ _____

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Example. Solve: $\log_2(x+1) - \log_2(x-1) = 4$

$$\log_2(x+1) - \log_2(x-1) = 4$$

$$\log_2 \frac{x+1}{x-1} = 4$$

$$\frac{x+1}{x-1} = 16$$

$$x+1 = 16x-16$$

$$17 = 15x$$

$$\frac{17}{15} = x$$

The solution is $\frac{17}{15}$.

Solve.

17. $\log x + \log(x+15) = 2$

19. $\log_3(2x-7) = 4$

21. $\log x + \log(x-21) = 2$

23. $\log(3x+4) = 1$

25. $\log x - \log(x+5) = -1$

27. $\log_4(x-6) + \log_4(x+6) = 3$

29. $\log x + \log(x-0.21) = -2$

31. $\log_7 x + \log_7(4x+21) = 3$

Check:

$$\begin{array}{l} \log_2(x+1) - \log_2(x-1) = 4 \\ \hline \log_2\left(\frac{17}{15} + 1\right) - \log_2\left(\frac{17}{15} - 1\right) \quad 4 \\ \log_2 \frac{32}{15} - \log_2 \frac{2}{15} \\ \log_2\left(\frac{32}{15} \div \frac{2}{15}\right) \\ \log_2 16 \\ 4 \end{array}$$

18. $\log(x+2) - \log x = 3$

20. $\log_5(x-11) = 2$

22. $\log_2(x-2) + \log_2(x+2) = 5$

24. $\log(x+33) - \log x = 2$

26. $\log_4(x+3) - \log_4 x = 3$

28. $\log_6 x + \log_6(x-9) = 2$

30. $\log(x-48) + \log x = 2$

32. $\log_2(5-x) = 4$
