

Practice Problems

Solve the following equations:

Remember that the arguments of all logarithms must be greater than 0. Also exponentials in the form of a^x will be greater than 0. Be sure to check all your answers in the original equation.

1. $3^{x-1} = 81$

2. $8^x = 4$

3. $e^x = 5$

4. $-14 + 3e^x = 11$

5. $-6 + \ln 3x = 0$

6. $\log(3x + 1) = 2$

7. $\ln x - \ln 3 = 4$

8. $2 \ln 3x = 4$

9. $5^{x+2} = 4$

10. $\ln(x + 2)^2 = 6$

11. $4^{-3x} = 0.25$

12. $2e^{2x} - 5e^x - 3 = 0$

13. $\log_7 3 + \log_7 x = \log_7 32$

14. $2 \log_6 4x = 0$

15. $\log_2 x + \log_2(x - 3) = 2$

16. $\log_2(x + 5) - \log_2(x - 2) = 3$

17. $4 \ln(2x + 3) = 11$

18. $\log x - \log 6 = 2 \log 4$

19. $2^x = 64$

20. $5^x = 25$

21. $4^{x-3} = \frac{1}{16}$

22. $3^{x-2} = 81$

23. $\log_3 x = 5$

24. $\log_4 x = 3$

25. $\log_2 2x = \log_2 100$

26. $\ln(x + 4) = \ln 7$

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

28. $\log_5(x - 10) = 2$

29. $3^x = 500$

30. $8^x = 1000$

31. $\ln x = 7.25$

32. $\ln x = -0.5$

33. $2e^{0.5x} = 45$

34. $100e^{-0.6x} = 20$

35. $12(1 - 4^x) = 18$

36. $25(1 - e^t) = 12$

37. $\log 2x = 1.5$

38. $\log_2 2x = -0.65$

39. $\frac{1}{3} \log_2 x + 5 = 7$

40. $4 \log_5(x + 1) = 4.8$

41. $\log_2 x + \log_2 3 = 3$

42. $2 \log_4 x - \log_4(x - 1) = 1$

$$1) 3^{x-1} = 81$$

$$3^{x-1} = 3^4$$

$$x-1=4$$

$$x=5$$

$$2) 8^x = 4$$

$$2^{3x} = 2^2$$

$$3x = 2$$

$$x = \frac{2}{3}$$

$$3) e^x = 5$$

$$\ln 5 = x$$

$$4) -14 + 3e^x = 11$$

$$3e^x = 25$$

$$e^x = \frac{25}{3}$$

$$1 = \ln \frac{25}{3} = x$$

$$5) -6 + \ln 3x = 0$$

$$\ln 3x = 6$$

$$e^6 = 3x$$

$$\frac{1}{3}e^6 = x$$

$$6) \log(3x+1) = 2$$

$$10^2 = 3x+1$$

$$100 = 3x+1$$

$$99 = 3x$$

$$33 = x$$

$$7) \ln x - \ln 3 = 4$$

$$\ln\left(\frac{x}{3}\right) = 4$$

$$e^4 = \frac{x}{3}$$

$$3e^4 = x$$

$$8) 2\ln 3x = 4$$

$$\ln 3x = 2$$

$$e^2 = 3x$$

$$\frac{1}{3}e^2 = x$$

$$9) 5^{x+2} = 4$$

$$\log 5^{x+2} = \log 4$$

$$(x+2)\log 5 = \log 4$$

$$x+2 = \frac{\log 4}{\log 5}$$

$$x = \frac{\log 4}{\log 5} - 2$$

$$10) \ln(x+2)^2 = 6$$

$$2\ln(x+2) = 6$$

$$\ln(x+2) = 3$$

$$e^3 = x+2$$

$$e^3 - 2 = x$$

or

$$11) 4^{-3x} = .25$$

$$4^{-3x} = \frac{1}{4}$$

$$4^{-3x} = 4^{-1}$$

$$-3x = -1$$

$$x = \frac{1}{3}$$

$$12) 2e^{2x} - 5e^x - 3 = 0$$

$$(2e^x + 1)(e^x - 3) = 0$$

$$2e^x + 1 = 0 \quad e^x = 3 = 0$$

$$2e^x = -1 \quad e^x = 3$$

$$e^x = -\frac{1}{2} \quad \ln 3 = x$$

$$19) 5^x \cdot 5^2 = 4$$

$$25 \cdot 5^x = 4$$

$$5^x = \frac{4}{25}$$

$$\log_5 \frac{4}{25} = x$$

$$13) \log_7 3 + \log_7 x = \log_7 32$$

$$\log_7 3x = \log_7 32$$

$$3x = 32$$

$$x = \frac{32}{3}$$

$$14) 2 \log_6 4x = 0$$

$$\log_6 4x = 0$$

$$6^0 = 4x$$

$$1 = 4x$$

$$\frac{1}{4} = x$$

$$15) \log_2 x + \log_2 (x-3) = 2$$

$$\log_2 x(x-3) = 2$$

$$2^2 = x(x-3)$$

$$4 = x^2 - 3x$$

$$16) \log_2 (x+5) - \log_2 (x-2) = 3$$

$$\log_2 \frac{x+5}{x-2} = 3$$

$$2^3 = \frac{x+5}{x-2}$$

$$0 = x^2 - 3x - 4$$

$$0 = (x-4)(x+1)$$

$$x-4=0 \quad x+1=0$$

$$x=4 \quad x=-1$$

$$8 = \frac{x+5}{x-2}$$

$$8(x-2) = x+5$$

$$8x - 16 = x + 5$$

$$7x = 21$$

$$x = 3$$

$$27) \log_3 (2x+1) = 2$$

$$3^2 = 2x+1$$

$$9 = 2x+1$$

$$8 = 2x$$

$$28) \log_5 (8x-16) = x+5$$

$$35 = x$$

$$17) 4 \ln(2x+3) = 11$$

$$\ln(2x+3) = \frac{11}{4}$$

$$18) \log x - \log 6 = 2 \log 4$$

$$\log \frac{x}{6} = \log 16$$

$$e^{\frac{11}{4}} = 2x+3$$

$$\frac{e^{\frac{11}{4}} - 3}{2} = x$$

$$\frac{x}{6} = 16$$

$$x = 96$$

$$31) 2e^{.5x} = 45$$

$$e^{.5x} = 22.5$$

$$\ln 22.5 = .5x$$

$$2 \ln 22.5 = x$$

$$6.227 = x$$

$$32) \ln x = -5$$

$$e^{-5} = x$$

$$x = .6065$$

$$19) 2^x = 64 = 2^6$$

$$2^x = 2^6$$

$$x = 6$$

$$20) 5^x = 25 = 5^2$$

$$5^x = 5^2$$

$$x = 2$$

$$21) 4^{x-3} = \frac{1}{16} = 4^{-2}$$

$$4^{x-3} = 4^{-2}$$

$$x-3 = -2$$

$$x = 1$$

$$22) 3^{x-2} = 81 = 3^4$$

$$3^{x-2} = 3^4$$

$$x-2 = 4$$

$$x = 6$$

$$23) \log_3 x = 5$$

$$3^5 = x$$

$$x = 243$$

$$24) \log_4 x = 3$$

$$4^3 = x$$

$$64 = x$$

$$25) \log_2 2x = \log_2 100$$

$$2x = 100^2$$

$$x = 50$$

$$26) \ln(x+4) = \ln 7$$

$$x+4 = 7$$

$$x = 3$$

$$27) \log_3 (2x+1) = 2$$

$$3^2 = 2x+1$$

$$9 = 2x+1$$

$$8 = 2x$$

$$4 = x$$

$$28) \log_5 (x-10) = 2$$

$$5^2 = x-10$$

$$25 = x-10$$

$$35 = x$$

$$29) 3^x = 500$$

$$\log_3 500 = x$$

$$x = \frac{\ln 500}{\ln 3} \approx 5.657$$

$$30) 8^x = 1000$$

$$\log_8 1000 = x$$

$$x = \frac{\ln 1000}{\ln 8} \approx 3.322$$

$$31) \ln x = 7.25$$

$$e^{7.25} = x$$

$$x = 1408.105$$

$$33) 2e^{.5x} = 45$$

$$e^{.5x} = 22.5$$

$$\ln 22.5 = .5x$$

$$2 \ln 22.5 = x$$

$$6.227 = x$$

$$32) \ln x = -5$$

$$e^{-5} = x$$

$$x = .6065$$

$$34) 100e^{-.6x} = 20$$

$$e^{-.6x} = \frac{1}{5}$$

$$\ln \frac{1}{5} = -.6x$$

$$\frac{\ln(1/5)}{-.6} = x$$

$$35) 12(1-4^x) = 18$$

$$1-4^x = \frac{3}{2}$$

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

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

$$\log_4 -\frac{1}{2} = x$$

NO SOLUTION

$$36) 25(1-e^t) = 12$$

$$1-e^t = \frac{12}{25}$$

$$-e^t = -\frac{13}{25}$$

$$e^t = \frac{13}{25}$$

$$\ln \frac{13}{25} = t$$

$$-.654 = t$$

$$37) \log 2x = 1.5$$

$$10^{1.5} = 2x$$

$$\log 10^{1.5} = \log 2x$$

$$1.5 = \log 2x$$

$$2x = 10^{1.5} = 31.6227766$$

$$x = 15.811388$$

$$38) \log_2 2x = -.65$$

$$2^{-.65} = 2x$$

$$\frac{2^{-.65}}{2} = x$$

$$.3253 = x$$

$$39) \frac{1}{3} \log_2 x + 5 = 7$$

$$\frac{1}{3} \log_2 x = 2$$

$$\log_2 x = 6$$

$$2^6 = x$$

$$64 = x$$

$$40) 4 \log_5 (x+1) = 4.8$$

$$\log_5 (x+1) = 1.2$$

$$5^{1.2} = x+1$$

$$5.8986 = x$$

$$41) \log_2 x + \log_3 3 = 3$$

$$\log_2 3x = 3$$

$$2^3 = 3x$$

$$8 = 3x$$

$$\frac{8}{3} = x$$

$$42) 2 \log_4 x - \log_4 (x-1) = 1$$

$$\log_4 \frac{x^2}{x-1} = 1$$

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

$$4x - 4 = x^2$$

$$0 = x^2 - 4x + 4$$

$$0 = (x-2)(x-2)$$

$$x = 2$$