

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.

- $3^{x-1} = 81$
- $8^x = 4$
- $e^x = 5$
- $-14 + 3e^x = 11$
- $-6 + \ln 3x = 0$
- $\log(3x + 1) = 2$
- $\ln x - \ln 3 = 4$
- $2 \ln 3x = 4$
- $5^{x+2} = 4$
- $\ln(x + 2)^2 = 6$
- $4^{-3x} = 0.25$
- $2e^{2x} - 5e^x - 3 = 0$
- $\log_7 3 + \log_7 x = \log_7 32$
- $2 \log_6 4x = 0$
- $\log_2 x + \log_2(x - 3) = 2$
- $\log_2(x + 5) - \log_2(x - 2) = 3$
- $4 \ln(2x + 3) = 11$
- $\log x - \log 6 = 2 \log 4$
- $2^x = 64$
- $5^x = 25$
- $4^{x-3} = \frac{1}{16}$
- $3^{x-2} = 81$
- $\log_3 x = 5$
- $\log_4 x = 3$
- $\log_2 2x = \log_2 100$
- $\ln(x + 4) = \ln 7$
- $\log_3(2x + 1) = 2$
- $\log_5(x - 10) = 2$
- $3^x = 500$
- $8^x = 1000$
- $\ln x = 7.25$
- $\ln x = -0.5$
- $2e^{0.5x} = 45$
- $100e^{-0.6x} = 20$
- $12(1 - 4^x) = 18$
- $25(1 - e^x) = 12$
- $\log 2x = 1.5$
- $\log_2 2x = -0.65$
- $\frac{1}{3} \log_2 x + 5 = 7$
- $4 \log_5(x + 1) = 4.8$
- $\log_2 x + \log_2 3 = 3$
- $2 \log_4 x - \log_4(x - 1) = 1$

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

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

$$x-1=4$$

$$x=5$$

$$2) 8^x = 4$$

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

$$3x = 2$$

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

$$3) e^x = 5$$

$$\ln 5 = x$$

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

$$3e^x = 25$$

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

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

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

$$\ln 3x = 6$$

$$e^6 = 3x$$

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

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

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

$$100 = 3x+1$$

$$99 = 3x$$

$$33 = x$$

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

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

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

$$3e^4 = x$$

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

$$\ln 3x = 2$$

$$e^2 = 3x$$

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

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

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

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

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

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

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

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

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

$$e^3 = x+2$$

$$e^3 - 2 = x$$

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

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

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

$$-3x = -1$$

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

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

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

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

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

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

$$e^x = 3$$

$$\ln 3 = x$$

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

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

$$3x = 32$$

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

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

$$\log_6 4x = 0$$

$$6^0 = 4x$$

$$1 = 4x$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$7x = 21$$

$$x = 3$$

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

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

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

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

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

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

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

$$x = 96$$

$$19) \begin{aligned} 2^x &= 64 \\ 2^x &= 2^6 \\ x &= 6 \end{aligned}$$

$$20) \begin{aligned} 5^x &= 25 \\ 5^x &= 5^2 \\ x &= 2 \end{aligned}$$

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

$$22) \begin{aligned} 3^{x-2} &= 81 \\ 3^{x-2} &= 3^4 \\ x-2 &= 4 \\ x &= 6 \end{aligned}$$

$$23) \begin{aligned} \log_3 x &= 5 \\ 3^5 &= x \\ x &= 243 \end{aligned}$$

$$24) \begin{aligned} \log_4 x &= 3 \\ 4^3 &= x \\ 64 &= x \end{aligned}$$

$$25) \begin{aligned} \log_2 2x &= \log_2 100 \\ 2x &= 100^2 \\ x &= 50 \end{aligned}$$

$$26) \begin{aligned} \ln(x+4) &= \ln 7 \\ x+4 &= 7 \\ x &= 3 \end{aligned}$$

$$27) \begin{aligned} \log_3 (2x+1) &= 2 \\ 3^2 &= 2x+1 \\ 9 &= 2x+1 \\ 8 &= 2x \\ 4 &= x \end{aligned}$$

$$28) \begin{aligned} \log_5 (x-10) &= 2 \\ 5^2 &= x-10 \\ 25 &= x-10 \\ 35 &= x \end{aligned}$$

$$29) 3^x = 500$$

$$30) 8^x = 1000$$

$$31) \ln x = 7.25$$

$$\log_3 500 = x \\ x = \frac{\ln 500}{\ln 3} = 5.657$$

$$\log_8 1000 = x \\ x = \frac{\ln 1000}{\ln 8} = 3.322$$

$$e^{7.25} = x \\ x = 1408.105$$

$$33) \begin{aligned} 2e^{.5x} &= 45 \\ e^{.5x} &= 22.5 \\ \ln 22.5 &= .5x \\ 2 \ln 22.5 &= x \\ 6.227 &= x \end{aligned}$$

$$32) \begin{aligned} \ln x &= -.5 \\ e^{-.5} &= x \\ x &= .6065 \end{aligned}$$

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

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

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

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

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

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

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

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

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

No Solution

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

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

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

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

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

$$-.654 = t$$

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

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

$$10^{1.5} = 2x$$
~~$$2x = 4.983$$~~

$$15.811 = x$$

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

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

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

$$.3253 = x$$

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

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

$$\log_2 x = 6$$

$$2^6 = x$$

$$64 = x$$

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

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

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

$$5.8986 = x$$

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

$$\log_2 3x = 3^2$$

$$2^3 = 3x$$

$$8 = 3x$$

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

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

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

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

$$x-1$$

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

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

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

$$x = 2$$