

# Homework 2.4/2.5: Solving Logarithms

Math 3

**Directions:** 2.4 Hwk Assg problems 1-20. Show all work on a separate sheet of paper!  
2.5 Hwk Assg problems 21-38. show all work on a separate sheet of paper!

In exercises 1 to 20, solve each logarithmic equation for x.

1.  $\log_4 x = 3$      $4^3 = X$
2.  $\log_3 x = -2$      $3^{-2} = X$
3.  $\log(x+1) = 2$      $10^2 = X+1$
4.  $\log_5(2x-1) = 2$      $5^2 = 2x-1$
5.  $\log_2 x + \log_2 8 = 6$      $2^6 = 8x$
6.  $\log 5 + \log x = 2$      $10^2 = 5x$
7.  $\log_3 x - \log_3 6 = 3$      $3^3 = \frac{x}{6}$
8.  $\log_4 x - \log_4 8 = 3$      $4^3 = \frac{x}{8}$
9.  $\log_2 x + \log_2(x+2) = 3$      $2^3 = x(x+2)$   
 $x^2 + 2x - 8 = 0$
10.  $\log_3 x + \log_3(2x+3) = 2$      $3^2 = x(2x+3)$   
 $2x^2 + 3x - 9 = 0$
11.  $\log_7(x+1) + \log_7(x-5) = 1$      $7^1 = (x+1)(x-5)$   
 $x^2 - 4x - 12 = 0$   
 $(x-6)(x+2) = 0$
12.  $\log_2(x+2) + \log_2(x-5) = 3$      $2^3 = x^2 - 3x - 10$   
 $x^2 - 3x - 18 = 0$   
 $(x-6)(x+3) = 0$
13.  $\log x - \log(x-2) = 1$      $10^1 = \frac{x}{x-2}$   
 $10x - 20 = x$
14.  $\log_5(x+5) - \log_5 x = 2$      $5^2 = \frac{x+5}{x}$      $25x = x+5$
15.  $\log_3(x+1) - \log_3(x-2) = 2$      $3^2 = \frac{x+1}{x-2}$      $9x - 18 = x+1$
16.  $\log(x+2) - \log(2x-1) = 1$      $10^1 = \frac{x+2}{2x-1}$      $20x - 10 = x+2$
17.  $\log(x+5) - \log(x-2) = \log 5$      $\frac{x+5}{x-2} = 5$      $5x - 10 = x+5$
18.  $\log_3(x+12) - \log_3(x-3) = \log_3 6$      $\frac{x+12}{x-3} = 6$      $6x - 18 = x+12$
19.  $\log_2(x^2-1) - \log_2(x-2) = 3$      $2^3 = \frac{(x^2-1)}{x-2}$      $8x - 16 = x^2 - 1$   
 $0 = x^2 - 8x + 15$   
 $0 = (x-5)(x-3)$
20.  $\log(x^2+1) - \log(x-2) = 1$      $10^1 = \frac{x^2+1}{x-2}$      $10x - 20 = x^2 + 1$   
 $0 = x^2 - 10x + 21$   
 $0 = (x-7)(x-3)$

In exercises 21 to 38, solve each exponential equation for x. Give your solutions in decimal form, correct to three decimal places.

21.  $5^x = 625$      $\log_5 625 = X$
22.  $4^x = 64$
23.  $2^{x+1} = \frac{1}{8}$      $2^{x+1} = 2^{-3}$
24.  $9^x = 3$      $3^{2x} = 3^1$
25.  $8^x = 2$      $2^{3x} = 2^1$
26.  $3^{2x-1} = 27$      $3^{2x-1} = 3^3$
27.  $3^x = 7$      $X = \frac{\ln 7}{\ln 3} = 1.771$
28.  $5^x = 30$      $X = \frac{\ln 30}{\ln 5} = 2.113$
29.  $4^{x+1} = 12$      $X = \frac{\ln 12}{\ln 4} - 1 = .792$
30.  $3^{2x} = 5$      $X = \frac{\ln 5}{\ln 3} \cdot \frac{1}{2} = .732$
31.  $7^{3x} = 50$      $X = \frac{\ln 50}{3 \ln 7} = .670$
32.  $6^{x-3} = 21$      $X = \frac{\ln 21}{\ln 6} + 3 = 4.699$
33.  $5^{3x-1} = 15$      $X = \frac{\ln 15}{3 \ln 5} + \frac{1}{3} = .894$
34.  $8^{2x+1} = 20$      $X = \left(\frac{\ln 20}{\ln 8} - 1\right) \frac{1}{2} = .220$
35.  $4^x = 3^{x+1}$      $X \ln 4 = (x+1) \ln 3$   
 $X(\ln 4 - \ln 3) = \ln 3$
36.  $5^x = 2^{x+2}$      $X \ln 5 = (x+2) \ln 2$   
 $X(\ln 5 - \ln 2) = 2 \ln 2$
37.  $2^{x+1} = 3^{x-1}$      $X = \frac{\ln 3}{\ln 4 - \ln 3} = 3.819$
38.  $3^{2x+1} = 5^{x+1}$      $X = \frac{2 \ln 2}{\ln 5 - \ln 2} = 1.513$

$(x+1) \ln 2 = (x-1) \ln 3$   
 $X(\ln 2 - \ln 3) = -\ln 3 - \ln 2$   
 $X = 4.419$

$(2x+1) \ln 3 = (x+1) \ln 5$   
 $X(2 \ln 3 - \ln 5) = \ln 5 - \ln 3$   
 $X = .869$

## ANSWERS

1.  $X = 64$
2.  $X = \frac{1}{9}$
3.  $X = 99$
4.  $X = 13$
5.  $X = 8$
6.  $X = 25$
7.  $X = 162$
8.  $X = 5/12$
9.  $X = 2$
10.  $X = -3$
11.  $X = 6$
12.  $X = -3$
13.  $X = \frac{20}{9}$
14.  $X = \frac{5}{24}$
15.  $X = \frac{19}{8}$
16.  $X = \frac{12}{19}$
17.  $X = \frac{15}{4}$
18.  $X = 6$
19.  $X = 3$
20.  $X = 7$
21.  $X = 4$
22.  $X = 4$
23.  $X = -4$
24.  $X = \frac{1}{2}$
25.  $X = \frac{1}{3}$
26.  $X = 2$
27.  $X = 1.771$
28.  $X = 2.113$
29.  $X = 0.792$
30.  $X = 0.732$
31.  $X = 0.670$
32.  $X = 4.699$
33.  $X = 0.894$
34.  $X = 0.220$
35.  $X = 3.819$
36.  $X = 1.513$
37.  $X = 4.419$
38.  $X = 0.869$