Math Xb—Spring 2004

Solving Exponential Equations

Note that $\log x = \log_{10} x$ and $\exp(x) = e^x$.

1. Find the value of x that solves the equation

$$3 \cdot 10^x = 9 \cdot 7^x.$$

(a) $x = \dfrac{\log 10}{\log 7}$

(b) $x = \dfrac{\log 3}{\log 10 - \log 7}$

(c) $x = \dfrac{\log 7}{3 \cdot \log 10}$

(d) $x = \dfrac{9 \cdot \log 7}{3 \cdot \log 10}$

(e) $x = \dfrac{\log 3 + \log 9}{\log 10 - \log 7}$

2. Find the value of x that solves the equation

$$8 \cdot 9^x = 4 \cdot 3^x.$$

(a) $x = \dfrac{\ln 4}{\ln 8 - \ln 9}$

(b) $x = \dfrac{\ln 8 + \ln 4}{\ln 3 - \ln 9}$

(c) $x = \dfrac{\ln 2}{\ln 3 - \ln 9}$

(d) $x = \dfrac{\ln 2}{\ln 9}$

(e) $x = \dfrac{\ln 9}{\ln 3}$

3. Find the value of x that solves the equation

$$9^{2x} = 11.$$

(a) $x = \log 11 - \log 9$

(b) $x = \dfrac{\log 11}{\log 9}$

(c) $x = \dfrac{\log\left(\frac{9}{2}\right)}{\log 11}$

(d) $x = \dfrac{\log 11}{2 \cdot \log 9}$

(e) $x = \dfrac{\log\left(\frac{11}{9}\right)}{\log 2}$

4. Find the value of x that solves the equation

$$2 \cdot 90^x = 12 \cdot 10^x.$$

(a) $x = \dfrac{\ln 6}{\ln 90 - \ln 10}$

(b) $x = \dfrac{\ln 24}{\ln\left(\frac{1}{9}\right)}$

(c) $x = \dfrac{12 \cdot \ln 10}{2 \cdot \ln 90}$

(d) $x = \dfrac{\ln 12 + \ln 2}{\ln 90 - \ln 10}$

(e) $x = \dfrac{\ln 10}{\ln 90}$

5. Find the value of x that solves the equation

$$7 \cdot 2^x = 49 \cdot \left(\frac{1}{2}\right)^x.$$

(a) $x = \dfrac{\log 7 + \log 49}{\log 2 - \log\left(\frac{1}{2}\right)}$

(b) $x = \dfrac{\log 7}{\log 2 + \log\left(\frac{1}{2}\right)}$

(c) $x = \dfrac{\log 49}{\log 7}$

(d) $x = \dfrac{49 \cdot \log\left(\frac{1}{2}\right)}{7 \cdot \log 2}$

(e) $x = \dfrac{\log 7}{2 \cdot \log 2}$

6. Find the value of x that solves the equation

$$16 \cdot \left(\frac{1}{3}\right)^x = 64 \cdot \left(\frac{1}{4}\right)^x.$$

(a) $x = \dfrac{\ln\left(\frac{1}{3}\right)}{\ln\left(\frac{1}{4}\right)}$

(b) $x = \dfrac{\ln 4}{\ln \frac{1}{3}}$

(c) $x = \dfrac{64 \cdot \ln\left(\frac{1}{4}\right)}{16 \cdot \ln\left(\frac{1}{3}\right)}$

(d) $x = \dfrac{\ln 4}{\ln 3 + \ln 4}$

(e) $x = \dfrac{\ln 4}{\ln\left(\frac{1}{3}\right) - \ln\left(\frac{1}{4}\right)}$

7. Find the value of x that solves the equation

$$32 \cdot 4^x = 128 \cdot \left(\frac{1}{4}\right)^x.$$

(a) $x = \dfrac{\log 4}{\log 4 - \log\left(\frac{1}{4}\right)}$

(b) $x = \dfrac{\log 4}{\log\left(\frac{1}{4}\right)}$

(c) $x = \dfrac{\log 128}{\log 32}$

(d) $x = \dfrac{128 \cdot \log\left(\frac{1}{4}\right)}{32 \cdot \log 4}$

(e) $x = \dfrac{4 \cdot \log 32}{\frac{1}{4} \cdot \log 128}$

8. Find the value of x that solves the equation

$$7 \cdot \left(\frac{1}{7}\right)^x = 49 \left(\frac{1}{49}\right)^x.$$

(a) $x = \dfrac{\ln\left(\frac{1}{7}\right)}{\ln\left(\frac{1}{49}\right)}$

(b) $x = \dfrac{\ln 7}{\ln\left(\frac{1}{7}\right) + \ln 49}$

(c) $x = \dfrac{49 \cdot \ln\left(\frac{1}{49}\right)}{7 \cdot \ln\left(\frac{1}{7}\right)}$

(d) $x = \dfrac{\ln\left(\frac{1}{7}\right)}{\ln\left(\frac{1}{7}\right) - \ln 49}$

(e) $x = \dfrac{\ln 49}{\ln 7}$

9. Find the value of x that solves the equation

$$17 \cdot \left(\frac{1}{6}\right)^x = 51 \cdot \left(\frac{1}{3}\right)^x.$$

(a) $x = \dfrac{51 \cdot \log\left(\frac{1}{3}\right)}{17 \cdot \log\left(\frac{1}{6}\right)}$

(b) $x = \dfrac{\frac{1}{3} \cdot \log 51}{\frac{1}{6} \cdot \log 17}$

(c) $x = \dfrac{\log 3}{\log\left(\frac{1}{6}\right) - \log\left(\frac{1}{3}\right)}$

(d) $x = \dfrac{\log 3}{\log\left(17 \cdot \frac{1}{6}\right) - 51 \cdot \log\left(\frac{1}{3}\right)}$

(e) $x = 3 + \dfrac{1}{\log\left(\frac{1}{6}\right) - \log\left(\frac{1}{3}\right)}$

10. Find the value of x that solves the equation

$$5 = e^{4x}.$$

(a) $x = \dfrac{\ln 5}{\ln 4}$

(b) $x = \ln 5 - \ln 4$

(c) $x = \dfrac{1}{5} \ln 4$

(d) $x = \dfrac{1}{4} \ln 5$

(e) $x = \ln 4 - \ln 5$

Answers

1. b	3. c	5. e	7. a	9. c
2. c	4. a	6. e	8. b	10. d