# Math Xb—Spring 2004

# Solving Logarithmic Equations

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

1. Find the value of $x$ that solves the equation

$$\ln(x + 2) = 5.$$

(a) $x = e^5 + 2$

(b) $x = e^5 - 2$

(c) $x = e^2 - 5$

(d) $x = e^2 + 5$

(e) None of the above.

2. Find the value of $x$ that solves the equation

$$\log x = 3$$

(a) $x = \dfrac{1}{1000}$

(b) $x = -\dfrac{1}{1000}$

(c) $x = 1000$

(d) $x = -1000$

(e) None of the above.

3. Find the value of $x$ that solves the equation

$$\log(2x^2 + 2) = 2.$$

(a) $x = 7$

(b) $x = -7$

(c) $x = 7$ or $-7$

(d) $x = 0$

(e) No solution.

4. Find the value of $x$ that solves the equation

$$4\ln x = \ln 8x$$

(a) $x = 2$

(b) $x = -2$

(c) $x = e^2$

(d) $x = e^{-2}$

(e) No solution.

5. Find the value of $x$ that solves the equation

$$3 \ln x^4 - 2 \ln 2x = 10.$$

(a) $x = \exp\left(\dfrac{10 - 2\ln 2}{2}\right)$

(b) $x = \exp\left(\dfrac{-10 - 2\ln 2}{10}\right)$

(c) $x = \exp\left(\dfrac{2\ln 2 - 10}{10}\right)$

(d) $x = \exp\left(\dfrac{10 + 2\ln 2}{10}\right)$

(e) $x = \exp\left(\dfrac{10 - 2\ln 2}{10}\right)$

6. Find the value of $x$ that solves the equation

$$\log x - \log(x + 1) = 2.$$

(a) No solution.

(b) $x = \dfrac{99}{100}$

(c) $x = -\dfrac{99}{100}$

(d) $x = \dfrac{100}{99}$

(e) $x = -\dfrac{100}{99}$

7. Find the value of $x$ that solves the equation

$$\ln \sqrt{x} + \ln x^2 = 1 - 2\ln x.$$

(a) $x = e^{2/9}$

(b) $x = e^{9/2}$

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

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

(e) No solution.

8. Find the value of $x$ that solves the equation

$$\ln(x - 3) - \ln(2x + 1) = 0.$$

(a) $x = 2$

(b) No solution.

(c) $x = 1$

(d) $x = 4$

(e) $x = -4$

9. Find the value of $x$ that solves the equation

$$3^{\ln x} = 5x.$$

(a) $x = \exp\left(\dfrac{\ln 5}{\ln 3 + 1}\right)$

(b) $x = \exp\left(\dfrac{\ln 3}{\ln 5 - 1}\right)$

(c) $x = \exp\left(\dfrac{\ln 5}{\ln 3 - 1}\right)$

(d) $x = \exp\left(\dfrac{\ln 5 - 1}{\ln 3}\right)$

(e) $x = \exp\left(\dfrac{\ln 3 - 1}{\ln 5}\right)$

10. Find the value of $x$ that solves the equation

$$(\ln x)^2 - \ln x = 0.$$

(a) $x = e$

(b) $x = 1$

(c) $x = -e$ or $1$

(d) $x = 1$ or $e$

(e) $x = e$ or $-1$

## Answers

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