

**Problem 3.1** No partial credit will be given for incorrect answers.

- Evaluate  $\log_{16} 2$
- Solve for  $x$ :  $\log_3 x = -2$ .
- Condense  $2 \ln x^2 + \frac{1}{4} \ln \sqrt{x}$  into a single logarithm.
- Simplify  $e^{4t \ln 2}$ .
- Evaluate  $\log_{\sqrt[3]{7}} 49$
- Simplify  $16^{\log_4 5}$ .
- $\log_5 555$  is in between what two integers?
- Evaluate  $\log_{3\sqrt{3}} \frac{1}{9}$
- Evaluate  $\log_2 \frac{1}{16}$
- Evaluate  $\log_{\sqrt{6}} \frac{1}{36}$
- Evaluate  $\log_9 1$
- Evaluate  $4^{\log_4 12}$

**Problem 3.2** Solve for  $x$ :

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

**Problem 3.3** For the following problems, use the fact that  $9^{0.316} \approx 2$ .

- Compute  $\log_9 2$ .
- Compute  $\log_9 18$ .
- Compute  $\log_3 2$ .
- Compute  $\log_9 0.5$ .

**Problem 3.4** Solve for  $x$  *exactly*:

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

**Problem 3.5** How many digits are in the usual base-10 representation of  $3^{2000}$ ?

**Problem 3.6** Twenty years ago, \$3,000 was invested into a savings fund. Ten years ago, another \$2,000 was invested into another savings fund with the same interest rate as the first fund. Both savings funds use continuous compound interest. Now, the combined worth of the two funds is \$8,000. Find the interest rate.

**Problem 3.7** Solve for  $x$ :

$$\frac{\log_8(x^4)}{1 + \log_8 x} = \frac{5}{2}$$

**Problem 3.8** Simplify

$$\frac{1}{\log_{12} 36} - \frac{1}{\log_2 36}$$

**Problem 3.9**

- Sketch the graph of  $f(x) = \left(\frac{1}{2}\right)^x$ . Be sure to label all intercepts.
- Sketch the graph of  $f(x) = \log_3 x$ . Be sure to label all intercepts.

**Problem 3.10** A hot cup of coffee, with an initial temperature of  $200^\circ$ , is placed in a refrigerator whose temperature is  $40^\circ$ . After 6 minutes, the temperature of the coffee is  $80^\circ$ . Determine the temperature of the coffee after 9 minutes.

**Problem 3.11** Solve for  $x$  *exactly*:

$$e^{2x} + e^x - 6 = 0$$

**Problem 3.12** An investor places \$5,000 into a savings account that gains 6% interest, compounded monthly. How long will it take for the account to be worth \$8,000?

**Problem 3.13** The cells in a student's brain experience radioactive decay, beginning with the start of classes. Initially, the brain has 15,000,000 cells. After 15 days, the brain has 10,000,000 cells. Determine the half-life for brain cell decay.