

Instructions: Show work on a separate sheet of paper and attach to this page. You may check your work with technology not available in class, but you should be able to solve problems and show work without such technology.

- Evaluate with a calculator and round to 4 decimal places.
 - $2^{3.4}$
 - $\log_{15} 13$
 - $e^{2.3}$
 - $\log_{\pi} 63$
 - $4^{-1.5}$
 - $\log_{0.3} 19$
 - $e^{-0.95}$
 - $\log_{16} 57.2$
 - $\left(\frac{1}{3}\right)^{1.7}$
 - $\ln(11)$
 - $(\ln 2)^{-1.8}$
 - $\log_{\frac{1}{6}} 99$
- Graph the function by hand by plotting at least 5 points.
 - $f(x) = \left(\frac{3}{2}\right)^x$
 - $g(x) = \left(\frac{1}{2}\right)^x$
 - $f(x) = 0.8^x$
- Sketch the base graph $f(x) = 2^x$, then write the function that applies the following transformations, and sketch the resulting graph. Find the inverse of each graph, and then sketch that graph also.
 - Shift left 1
 - Reflect across the x-axis, and shift down 1
 - Stretch vertically by a factor of 3, shift right 1, and shift down 4.
 - $g(x) = f(-x)$
 - $g(x) = \frac{1}{2}f(x - 2) + 3$
- Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$ or $A = Pe^{rt}$ to solve the following problems.
 - Find the value of an investment for five years at an interest rate of 5.5% if the money is compounded i) monthly, ii) weekly, iii) annually, iv) daily, v) continuously.
 - Suppose that you want \$12,000 after 4 years. How much money would you need to invest at 8.25% interest if money is compounded i) annually, ii) monthly, iii) daily, iv) continuously.
- Evaluate each expression without using a calculator.
 - $\log_4 16$
 - $\log_2 \frac{1}{\sqrt{2}}$
 - $8^{\log_8 19}$
 - $\log_6 1$
 - $\log_5 5$
 - $\log_3 \frac{1}{9}$
 - $\log_4 4^6$
 - $e^{\ln(11)}$
- Describe a procedure for graphing the function $f(x) = 2 + \log_3 x$ without a calculator, and without using the change of base formula.
- Find the domain and range of each function.
 - $f(x) = 3e^x - 2$
 - $h(x) = \frac{1}{2} \ln x$
 - $m(x) = \ln(x^2 - 4x - 12)$
 - $g(x) = -2\left(\frac{1}{3}\right)^{x+2} + 5$
 - $k(x) = 2 - \ln(7 - x)$
 - $n(x) = \ln\left(\frac{x-2}{x+5}\right)$
- Solve for x .
 - $\log_4 x = -3$
 - $\log_{64} x = \frac{2}{3}$
 - $\log_5(x + 4) = 2$

9. Expand each logarithmic expression as much as possible. Simplify when possible.

a. $\log_9 \left(\frac{9}{x} \right)$

d. $\log_b \left(\frac{\sqrt{xy^3}}{z^3} \right)$

g. $\ln \left[\frac{x^4 \sqrt{x^2+3}}{(x+3)^5} \right]$

b. $\ln \sqrt[7]{x}$

e. $\ln \sqrt{ex}$

h. $\log \left[\frac{100x^3 \sqrt[3]{5-x}}{3(x+7)^2} \right]$

c. $\log_8 \left(\frac{64}{\sqrt{x+1}} \right)$

f. $\log_2 \sqrt[5]{\frac{xy^4}{16}}$

10. Combine each expression into a single logarithmic expression.

a. $\log 5 + \log 2$

d. $\frac{1}{2}(\log_5 x + \log_5 y) - 2 \log_5(x + 1)$

b. $4 \ln(x + 6) - 3 \ln z$

e. $\log x + \log(x^2 - 1) - \log 7 - \log(x + 1)$

c. $\frac{1}{3}(\log_4 x - \log_4 y)$

f. $3 \ln x + 5 \ln y - \ln z$

11. Determine if each statement is true or false. If it is false, write a statement that is true.

a. $\ln e = 0$

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

c. $\log_6 \frac{x-1}{x^2+4} = \log_6(x-1) - \log_6(x^2+4)$

d. $\log_3 7 = \frac{1}{\log_7 3}$

12. Solve the equations without a calculator.

a. $3^x = 81$

c. $3^{1-x} = \frac{1}{27}$

e. $125^x = 625$

b. $4^{2x-1} = 64$

d. $8^{1-x} = 4^{x+2}$

f. $e^{x+4} = \frac{1}{e^{2x}}$

13. Solve each logarithmic or exponential equation and write the solution(s) to 4 decimal places.

a. $e^{1-5x} = 793$

e. $5^{2x+3} = 3^{x-1}$

b. $7^{x+2} = 10,476$

f. $3^{2x} + 3^x - 2 = 0$

c. $\log_4(3x + 2) = 3$

g. $\log_4(x + 2) - \log_4(x - 1) = 1$

d. $\log_2(4x + 1) = 5$

h. $\ln(x - 4) + \ln(x + 1) = \ln(x + 8)$

14. Solve each equation numerically using a calculator.

a. $3^x = 2x + 3$

b. $5^x = \log_3(3x + 4)$

15. The half-life of krypton-91 is 10 seconds. If 16 grams of krypton-91 are initially present, how many grams are present after 30 seconds?

16. The half-life of thorium-229 is 7340 years. How long will it take for a sample of this substance to decay to 20% of its original amount?

17. Xanax is a tranquilizer used in the short-term relief of symptoms of anxiety. It's half-life in the bloodstream is 36 hours. How long will it take for Xanax to decay to 90% of its original dosage?