

Logarithmic Functions Practice Questions

1) Re-write each of the following equalities in logarithmic form.

a) $3^4 = 81$

b) $s^v = w$

c) $5^{3/2} = \sqrt{125}$

d) $\left(\frac{1}{3}\right)^3 = \frac{1}{27}$

e) $3^0 = 1$

f) $\left(\frac{1}{4}\right)^{-4} = 256$

2) Re-write each of the following equalities in exponential form

a) $\log_2 32 = 5$

b) $\log 1000 = 3$

c) $\log_4 \frac{1}{4} = -1$

d) $\log_5 1 = 0$

e) $\log_2 \frac{1}{16} = -4$

f) $\log_3 3^4 = 4$

3) Use your calculator to evaluate each logarithm to 4 decimal places.

a) $\log 5$

b) $\ln 3$

c) $\log_3 90$

d) $\log_3 \frac{1}{27}$

e) $\ln e$

f) $\log_{\frac{1}{3}} 9$

4) Solve each equation for x

a) $\log_{\frac{1}{3}} x = 4$

b) $\log_x 64 = 3$

c) $\log \sqrt{8} = x$

d) $3^x = 12$

e) $x^5 = 0.5$

f) $\ln x = 10$

g) $\log_3 -7 = x$

h) $\log_3 7 = x$

i) $\log x^2 = 10\,000$

5) Re-write each of the following expressions using a single logarithm

a) $4 \log_3 6$

b) $\log 5 + \log 5 + \log 5$

c) $4 \log_3 81 - \log_3 9$

d) $4 \log_m x - 2 \log_m x$

e) $2 \log a + 5 \log b$

f) $3 \log x + \frac{1}{2} \log y$

g) $2 \log_a m + \log_a n - 5 \log_a p$

h) $\log(x^2 - 1) - \log(x - 1)$

i) $\frac{\log_a 16}{\log_a 4} - \log_4 2$

j) $\log_4 x + \log_6 20$

k) $\log_2 x + \log_4 y - \log_{16} z$

6) For each of the following cases, indicate whether the function is increasing or decreasing.

a) $f(x) = \log_2 x$

b) $g(x) = \log_{0.3} x$

c) $h(x) = 2 \ln x + 9$

d) $i(x) = 3 \log_{0.5}(4 - x) + 1$

e) $j(x) = -\ln(x - 7)$

f) $k(x) = \log(x + 5) + 8$

7) Find the equation of the asymptote of the curve associated with each of the functions defined below.

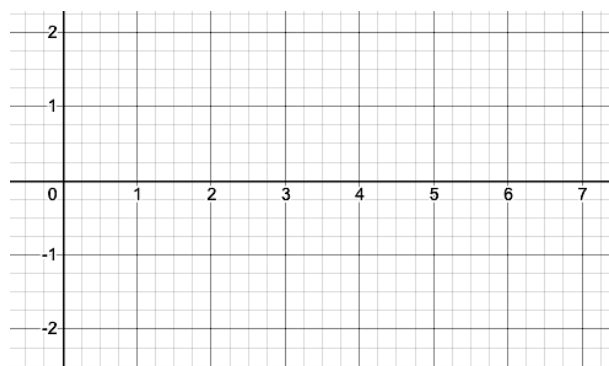
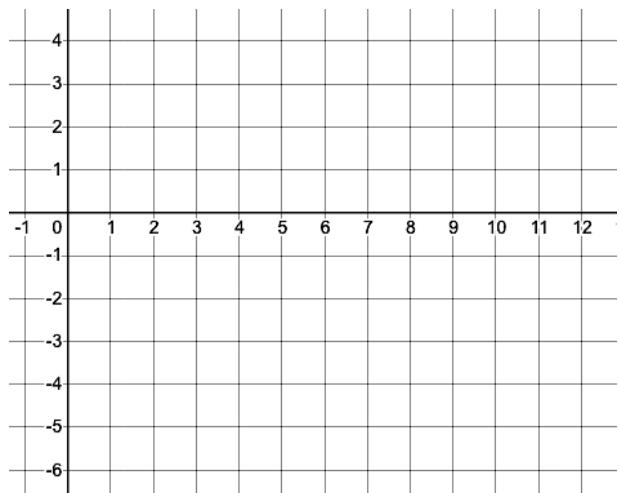
a) $f(x) = -\log(4(x + 3)) + 5$

b) $g(x) = 5 \log(2x + 8) - 6$

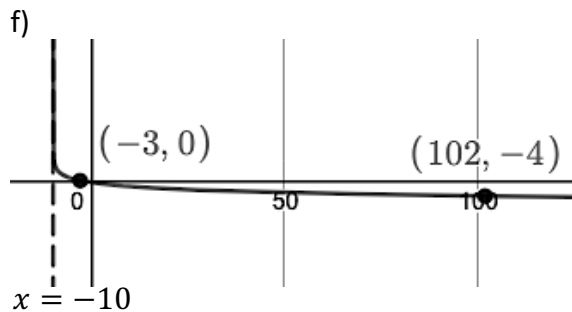
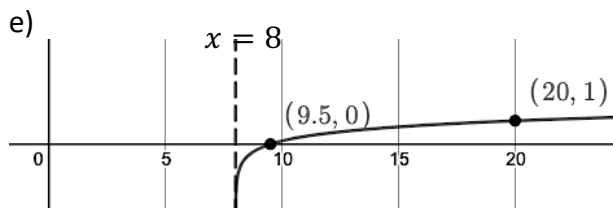
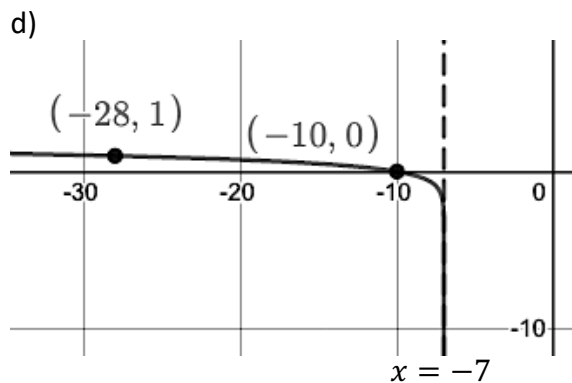
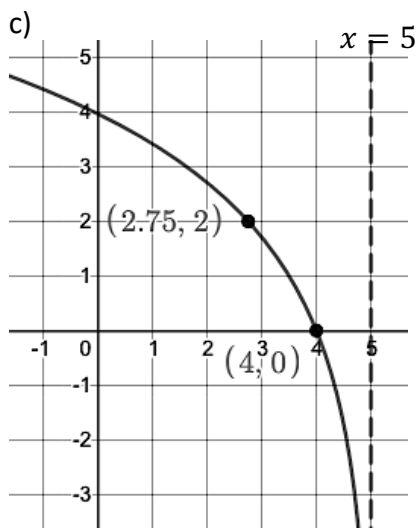
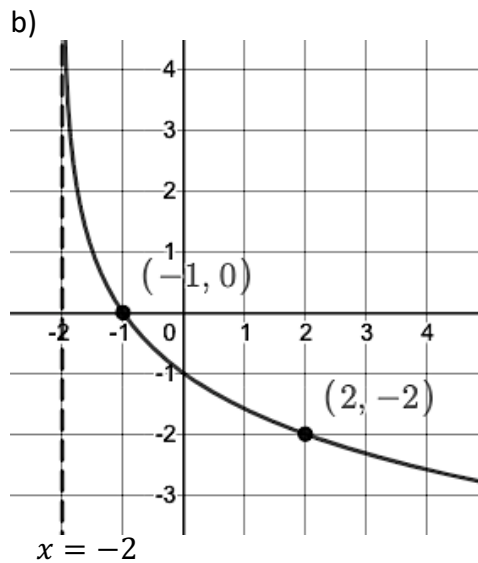
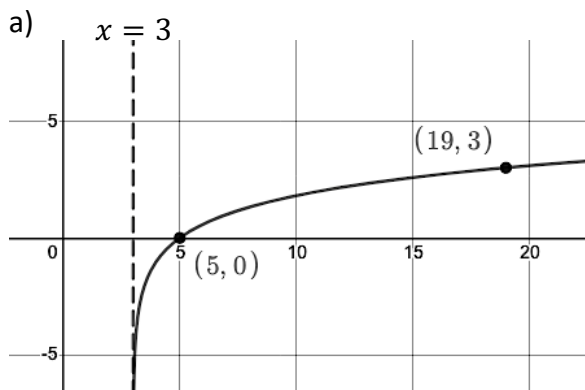
8) Sketch the graphs of the following functions.

a) $\log_3 x$

b) $\log x^{1/4}$



9) Determine the rule of each of the logarithmic functions represented in the graphs below.



10) Solve the following:

a) Given $f(x) = \log_{\frac{1}{2}}(2(x+4)) - 10$

Determine when $f(x) = 14$

b) Given $g(x) = -2 \log_3 \left(-\frac{1}{2}(x+2) \right) + 4$

Determine when $g(x) = -6$

c) Given $h(x) = -\frac{1}{2} \log_{0.7}(3x+2) - 10$

Determine when $h(x) = -5.8$

d) Given $i(x) = \log(2x+3)$
and $j(x) = \log 4 - x$

Determine when $i(x) = j(x)$

11) Solve the following inequalities:

a) $20 \log(x - 5) + 30 \geq 50$

b) Determine the interval over which
 $-2 \log_{0.3}(3x + 4) - 8 \leq 2$

c) $-0.5 \ln 2x < -6$

d) $-3 \log x \leq 21$

c) Given $f(x) = -2 \log_2(-x)$ and $g(x) = 2 \log_4(x + 6) - 2$
Determine the interval over which $f(x) \leq g(x)$.

12) Solve the following exponential functions:

a) $\left(\frac{1}{2}\right)^{x+2} = 28$

b) $13^{\left(\frac{2-x}{4}\right)} = \frac{3}{8}$

c) $21^{4x} = 0.35$

d) $3\left(\frac{1}{2}\right)^{-2x+5} = 21$

e) $3^{x+5} = 4^{x+3}$

f) $2.5(10)^x = 6(e^{4x-3})$

13) The value, V (in \$) of an investment changes according to the rule $V = 15\,000(1.015)^{2t}$ where t is time (in years). When is the value of the investment:

a) \$15 000

b) \$20 000

c) \$22,000

14) The town of Springfield is growing at a rate of 6.5% per year. How many people are there in Springfield now, if there will be 15 000 people in 4.5 years?

15) A delivery company estimates that its road equipment depreciates by 30% each year. After 5 years one of its transport trucks was worth \$12 605.

a) How much did the company pay for this truck?

b) After how much time was the truck worth 10% of its original cost?

16) To produce maple syrup, 1000L of sap is boiled until 97.5% of its initial quantity has evaporated. With each hour of boiling, the quantity of sap decreases by 10% in relation to the amount from the previous hour. When should the boiling process be stopped?

17) State the rule for the inverse of each of the functions defined below.

a) $f(x) = \log_4 x$

b) $g(x) = \log x^{1/3}$

c) $h(x) = \log_6 x$

d) $f(x) = 2 \log_5 3(x - 1)$

e) $g(x) = -\log 2x + 15$

f) $h(x) = -\ln -(x + 3) - 10$

18) Camilla deposits a \$1500 scholarship she received into an account with an annual interest rate of 3.5% compounded every 6 months. When does the value of the investment reach \$2500?