

Algebra 2 · Logarithms and Logarithmic Functions · Worksheet Answer Key

Common Core F-LE.A.4, F-BF.B.4a, F-IF.C.7e · mathovore.fr

This algebra 2 logarithms worksheet answer key solves all 23 problems of the logarithms and logarithmic functions worksheet step by step.

Every solution shows the exponent or property that gives the answer. Compare each step with your own work, and recompute any logarithm you got wrong by writing it as a power of the base.

Algebra 2 Common Core: F-LE.A.4 · F-BF.B.4a · F-IF.C.7e

Algebra 2 Logarithms Worksheet Answer Key: problems 1-5

Problem 1: Exponential to log form

The base stays the base and the exponent becomes the value of the log.

- a. $\log_2 32 = 5$
- b. $\log_{10} 1000 = 3$
- c. $\log_3 \frac{1}{9} = -2$
- d. $\log_7 1 = 0$

Problem 2: Log to exponential form

Write the base raised to the logarithm; the result is the number inside the log.

- a. $4^3 = 64$
- b. $5^{-2} = \frac{1}{25}$
- c. $9^{1/2} = 3$
- d. $10^{-2} = 0.01$

Problem 3: Evaluate simple logs

Ask which power of the base gives the number.

- a. $2^4 = 16$, so **4**
- b. $3^4 = 81$, so **4**
- c. $5^3 = 125$, so **3**
- d. $10^5 = 100000$, so **5**

Problem 4: Evaluate fractions and roots

- a. $2^{-3} = \frac{1}{8}$, so **-3**
- b. $4^{1/2} = 2$, so $\frac{1}{2}$
- c. Write $8 = 2^3$ and $4 = 2^2$: $2^{3y} = 2^2$, so $3y = 2$ and the value is $\frac{2}{3}$
- d. $\left(\frac{1}{2}\right)^{-3} = 2^3 = 8$, so **-3**

Problem 5: Special values

- a. Any base to the power 0 is 1, so **0**
- b. $12^1 = 12$, so **1**
- c. $\log_b b^x = x$, so **5**
- d. $b^{\log_b x} = x$, so **11**

Algebra 2 Logarithms Worksheet Answer Key: problems 6-10

Problem 6: Find the base or the value

- a. $b^2 = 49$, so $b = 7$ (the base must be positive)
- b. $b^3 = 64$, so $b = 4$
- c. $x = 3^4$, so $x = 81$
- d. $x = 2^{-5}$, so $x = \frac{1}{32}$

Problem 7: Common logarithms

- a. $10^3 = 1000$, so **3**
- b. $10^{-3} = 0.001$, so **-3**
- c. $10^{1/2} = \sqrt{10}$, so $\frac{1}{2}$
- d. $10^2 = 100 < 450 < 1000 = 10^3$, so $\log 450$ is between **2 and 3** (a calculator gives $\log 450 \approx 2.653$)

Problem 8: Natural logarithms

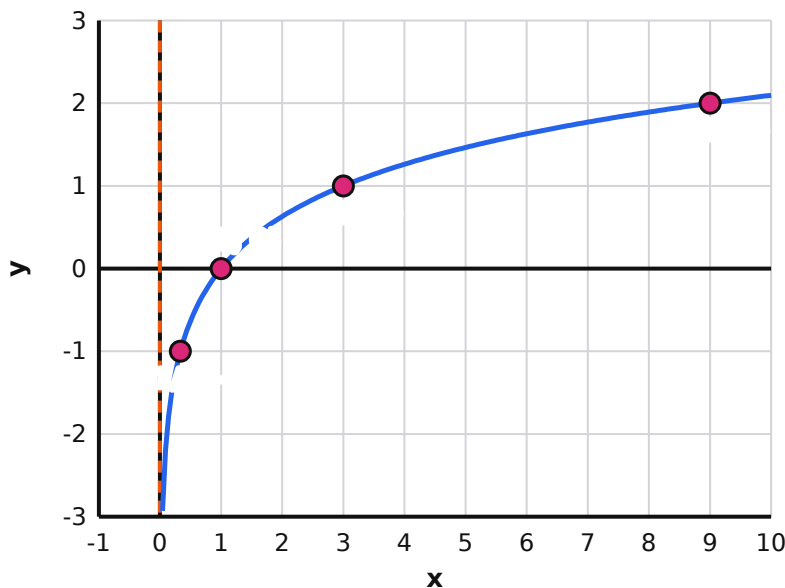
- a. **4**
- b. $e^0 = 1$, so **0**
- c. **1**
- d. $\frac{1}{e^3} = e^{-3}$, so **-3**
- e. **9**

Problem 9: Use a calculator

- a. **1.9459**
- b. **1.7482**
- c. **-0.6931** (negative because $0.5 < 1$)

Problem 10: Read a log graph

- a. The curve crosses the x-axis at $(1,0)$.
- b. Domain $x > 0$; range **all real numbers**.
- c. The curve approaches the y-axis: $x = 0$.
- d. The points $(9,2)$ and $(\frac{1}{9}, -1)$ are on the graph, so $\log_3 9 = 2$ and $\log_3 \frac{1}{9} = -2$.



The same graph with its points and asymptote labeled.

Algebra 2 Logarithms Worksheet Answer Key: problems 11-15

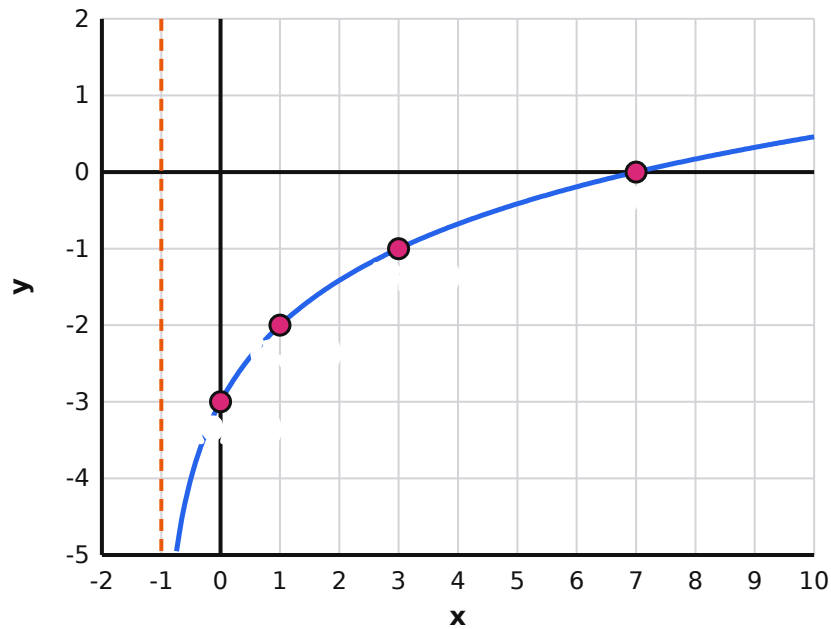
Problem 11: Domain of a log function

The argument of a logarithm must be positive.

- a. $x-3 > 0$, so $x > 3$
- b. $5-x > 0$, so $x < 5$
- c. $2x+6 > 0$, so $x > -3$: $x > -3$
- d. $x^2-9 > 0$ means $(x-3)(x+3) > 0$, so $x < -3$ **or** $x > 3$

Problem 12: Transformations of a log graph

- a. The basic graph is shifted 1 unit left, so the asymptote is $x = -1$.
- b. Domain: $x > -1$.
- c. $g(0) = \log_2 1 - 3 = -3$, so the y-intercept is $(0, -3)$.
- d. $\log_2(x+1) = 3$, so $x+1 = 8$ and the x-intercept is $(7, 0)$.



The graph with the asymptote and the four labeled points.

Problem 13: Expand a logarithm

- $\log_3 9 + \log_3 x = 2 + \log_3 x$
- $3\log_2 x - \log_2 y$
- $\log_5 25 + \log_5 x^{1/2} = 2 + \frac{1}{2}\log_5 x$
- $\ln e^2 + 4\ln x - 3\ln y = 2 + 4\ln x - 3\ln y$

Problem 14: Condense a logarithm

- $\log_2 30$
- $\log 2^3 + \log 5 = \log 8 + \log 5 = \log 40$
- $\ln 3$
- $\log_3(x^2(x+1))$
- $\log_7 \frac{\sqrt{x}}{y^3}$

Problem 15: Evaluate with properties

- $\log_6 36 = 2$
- $\log_2 \frac{96}{3} = \log_2 32 = 5$
- $\log_8 2^3 = \log_8 8 = 1$
- $\log_3 36 - \log_3 4 = \log_3 9 = 2$

Algebra 2 Logarithms Worksheet Answer Key: problems 16-20

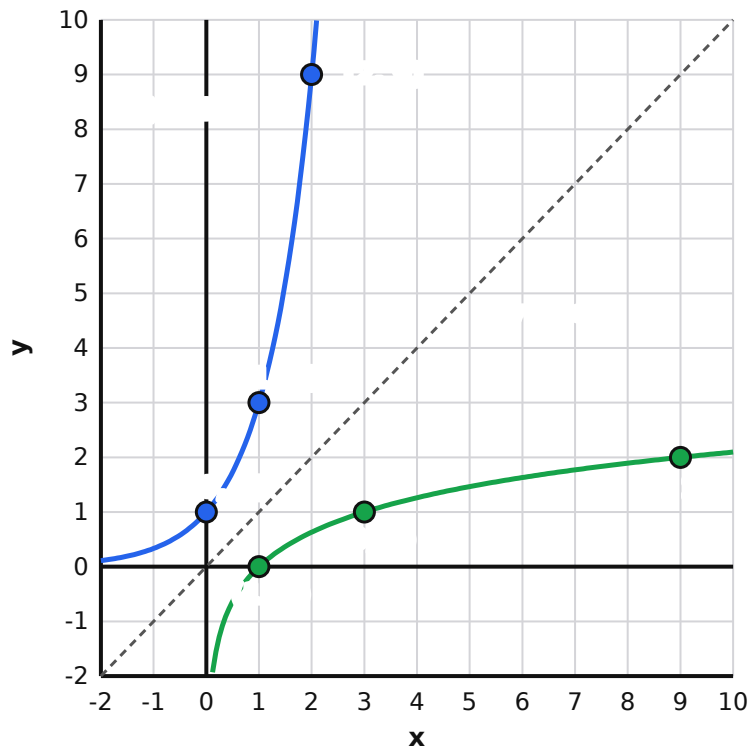
Problem 16: Change of base

- $\frac{\ln 20}{\ln 3} \approx \frac{2.9957}{1.0986} \approx 2.7268$
- $\frac{\ln 8}{\ln 5} \approx \frac{2.0794}{1.6094} \approx 1.2920$

c. $\frac{\ln 500}{\ln 12} \approx \frac{6.2146}{2.4849} \approx 2.5009$

Problem 17: Find an inverse function

- Swap and solve: $x = 3^y$, so $f^{-1}(x) = \log_3 x$.
- Swap the coordinates: $(1,0)$, $(3,1)$, $(9,2)$.
- $x = 2 \cdot 4^y$, so $\frac{x}{2} = 4^y$ and $g^{-1}(x) = \log_4 \frac{x}{2}$. Check: $g(1) = 8$ and $\log_4 4 = 1$.
- $x = \log_2 y + 3$, so $\log_2 y = x - 3$ and $h^{-1}(x) = 2^{x-3}$. Check: $h(8) = 6$ and $2^3 = 8$.



The graph of f and its inverse, mirrored over $y = x$.

Problem 18: Earthquake magnitudes

- $\frac{I_7}{I_5} = \frac{10^7}{10^5} = 10^2 = \mathbf{100 \text{ times}}$ as intense.
- $\frac{I}{I_0} = 10^{6.4} \approx 2.51 \times 10^6$, so **about 2,510,000**.

Problem 19: Acidity and pH

- $-\log 10^{-2} = \mathbf{2}$
- $[H^+] = 10^{-5} = \mathbf{0.00001 \text{ mol/L}}$
- $\frac{10^{-2}}{10^{-5}} = 10^3 = \mathbf{1000 \text{ times}}$
- $-\log(3.2 \times 10^{-5}) = 5 - \log 3.2 \approx 5 - 0.5051 = \mathbf{4.49}$

Problem 20: Sound levels

- $10 \log \frac{I}{I_0} = 60$, so $\log \frac{I}{I_0} = 6$ and the ratio is 10^6 .
- $\log \frac{I}{I_0} = 9$, so the ratio is 10^9 .

c. $\frac{10^9}{10^6} = \mathbf{1000 \text{ times.}}$

d. $L = 10 \log(2 \cdot 10^9) = 10(\log 2 + 9) \approx 10(0.3010 + 9) = \mathbf{93.01 \text{ dB.}}$

Algebra 2 Logarithms Worksheet Answer Key: problems 21-23

Problem 21: Digits of a large number

For a positive whole number N , rounding $\log N$ down to a whole number gives one less than the number of digits of N .

$\log 2^{50} = 50 \log 2 \approx 50(0.30103) = 15.0515$. Round down to 15 and add 1: **16 digits**. Check: $2^{50} = 1,125,899,906,842,624$ has 16 digits.

Problem 22: Invert a growth model

$\frac{P}{500} = 2^{t/3}$, so $\frac{t}{3} = \log_2 \frac{P}{500}$ and $t = 3 \log_2 \frac{P}{500}$.

For $P = 4000$: $t = 3 \log_2 8 = 3 \cdot 3 = \mathbf{9 \text{ hours}}$. Check: $500 \cdot 2^3 = 4000$.

Problem 23: Find the error

The product rule applies to $\log_2(3x)$, not to a sum inside the log.

For $x = 5$: $\log_2(5+3) = \log_2 8 = 3$, but $\log_2 5 + \log_2 3 \approx 2.3219 + 1.5850 = 3.9069$. **The two sides are not equal.**

How to use this algebra 2 logarithms worksheet answer key

Read this algebra 2 logarithms worksheet answer key after trying each problem yourself, and redo any problem you missed.

