

Log and Growth

Solve exponential and logarithmic equations, then check what works.

HIGH SCHOOL • MA.912.AR.5.2

MA.912.AR.5.2 "Solve one-variable equations involving logarithms or exponential expressions. Interpret solutions as viable in terms of the context and identify any extraneous solutions."

NAME _____

DATE _____

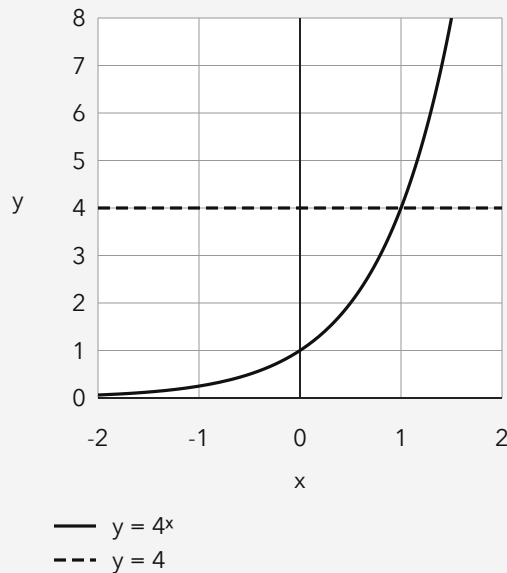
You will need: Pencil; Ruler

CHECK THE DOMAIN

Rewrite both sides with the same base when possible, then solve for x . For a logarithm, the expression inside the log must be positive, so check each result in the original equation and in the context.

WORKED EXAMPLE

Use the graph to solve $4^x = 4$.



1. Find where the curve $y = 4^x$ meets the line $y = 4$.
2. The intersection has x-coordinate 1.
3. Check: $4^1 = 4$.

Answer: $x = 1$

PRACTICE 6 problems

1 Solve $\log_5(x) = 3$.

ANSWER _____

3 Solve $\log_3(x - 5) = 2$.

ANSWER _____

5 Solve $\log_5(x - 6) = 2$.

ANSWER _____

2 Solve $2^x + 2 = 16$.

ANSWER _____

4 Solve $5^{2x} = 125$.

ANSWER _____

6 Solve $\log_6(x - 7) = \log_6(3 - x)$. State whether any algebraic result is extraneous.

ANSWER _____
_____**APPLY IT** Show your work

- 1**
- A student posts short videos online. The table shows the number of views, in hundreds, after
- t
- days. If the pattern continues, after how many days will the video have 4,800 views?

VIDEO VIEWS

t , days	Views, hundreds
0	6
1	12
2	24

REASONING AND ANSWER_____

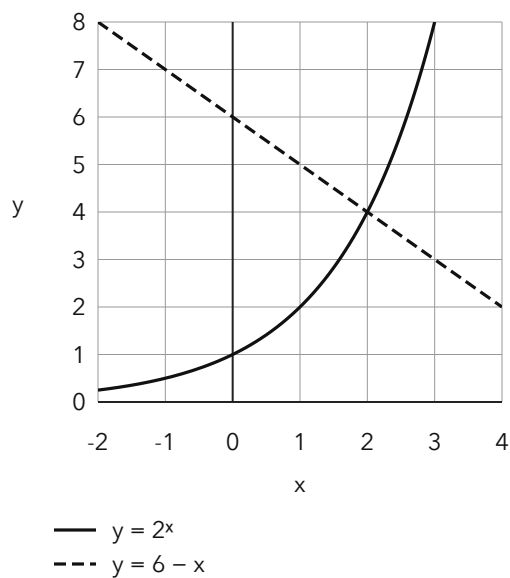
- 2**
- A phone battery has 96% charge at the start of a test. Its remaining charge is modeled by
- $B = 96(1/2)^x$
- , where
- x
- is the number of hours. How many hours will pass before the battery reaches 6% charge?

WORK SPACE

REASONING AND ANSWER_____

CHALLENGE One step up

Use the graph to solve $2^x = 6 - x$. Then explain in one sentence why there cannot be another solution.



WORK SPACE AND ANSWER

PRACTICE 1

$x = 125$

PRACTICE 2

$x = 2$

PRACTICE 3

$x = 14$

PRACTICE 4

$x = 3/2$

PRACTICE 5

$x = 31$

PRACTICE 6

No real solution. $x = 5$ is extraneous.

APPLY IT 1

3 days The views double each day, so $V = 6(2^t)$.
Solve $6(2^t) = 48$ to get $t = 3$.

APPLY IT 2

4 hours Set $96(1/2)^x$ equal to 6. Then $(1/2)^x = 1/16$, so $x = 4$, which is viable because time is nonnegative.

CHALLENGE

$x = 2$; as x increases, 2^x increases while $6 - x$ decreases, so they can intersect only once.

Accept equivalent exact forms, such as $x = 1.5$ for $x = 3/2$. For problem 6, accept an explanation that the log arguments cannot both be positive.