

Algebra 2 · Solving Exponential and Logarithmic Equations · Quiz

Common Core F-LE.A.4, A-SSE.B.3c · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

This 10-question multiple choice quiz checks solving exponential and logarithmic equations, extraneous solutions and applications to interest and half-life. Choose the one correct answer, then read each explanation.

Algebra 2 Common Core: **F-LE.A.4 · A-SSE.B.3c**

Questions

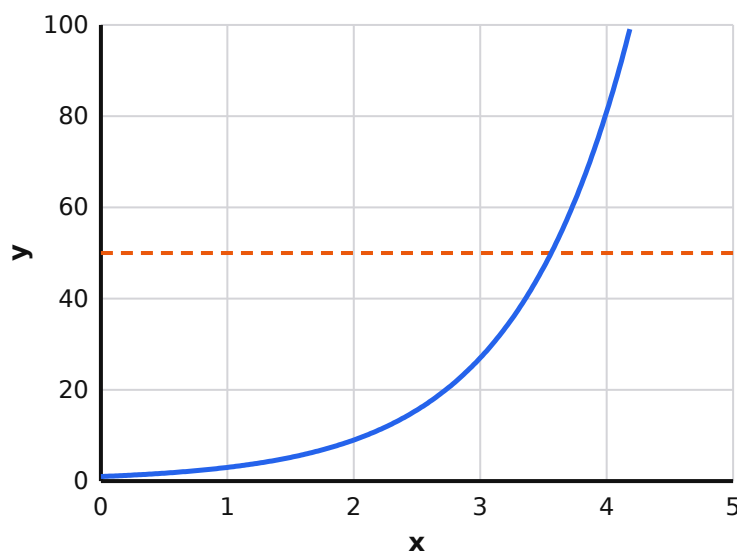
Question 1

Solve $2^{x+1} = 32$.

- A. $x = 5$
- B. $x = 6$
- C. $x = 16$
- D. $x = 4$

Question 2

The graph of $y = 3^x$ and the line $y = 50$ are shown. Solve $3^x = 50$ to the nearest thousandth.



The curve crosses $y = 50$ between $x = 3$ and $x = 4$.

- A. $x \approx 16.667$
- B. $x \approx 3.561$
- C. $x \approx 1.304$
- D. $x \approx 0.281$

Question 3

Solve $5 \cdot 2^x = 40$.

- A. $x = 8$
- B. $x = 3$
- C. $x = 4$
- D. $x \approx 5.13$

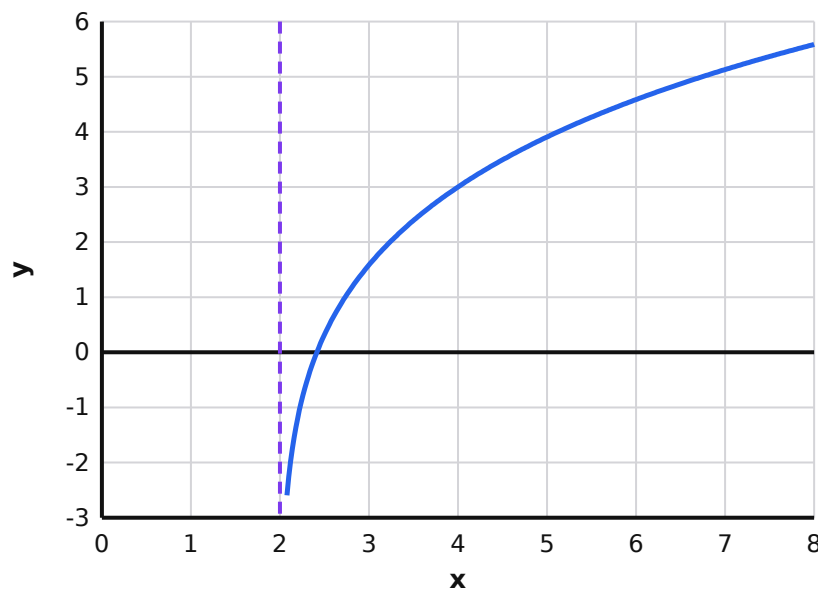
Question 4

Solve $\log_3(x-1) = 2$.

- A. $x = 9$
- B. $x = 7$
- C. $x = 10$
- D. $x = 5$

Question 5

The graph of $y = \log_2 x + \log_2(x-2)$ is shown. Solve $\log_2 x + \log_2(x-2) = 3$.



The curve exists only for $x > 2$.

- A. Only $x = -2$
- B. Both $x = 4$ and $x = -2$
- C. No solution
- D. Only $x = 4$

Question 6

Solve $\ln x = 3$. Round to the nearest hundredth.

- A. $x \approx 8.15$
- B. $x \approx 1.10$
- C. $x \approx 20.09$
- D. $x \approx 9.00$

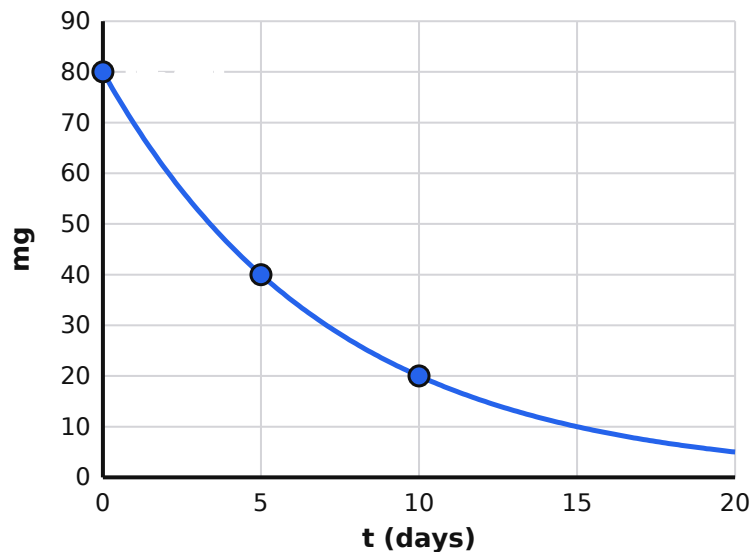
Question 7

Ava invests \$1,000 at 5% interest compounded annually. After how many years does the balance first reach \$2,000?

- A. About 13.86 years
- B. About 14.21 years
- C. About 20.00 years
- D. About 28.41 years

Question 8

An 80 mg dose has half-life 5 days, as graphed. After how many days do 10 mg remain?



The amount halves every 5 days.

- A. 15 days
- B. 10 days
- C. 20 days
- D. 35 days

Question 9

Rewrite 3^t in the form e^{kt} .

- A. e^{3t}

- B. $e^{0.4771}$
- C. $e^{0.9101}$
- D. $e^{1.0991}$

Question 10

Solve $4^x - 5 \cdot 2^x + 4 = 0$.

- A. $x=0$ or $x=2$
- B. $x=1$ or $x=4$
- C. $x=0$ or $x=4$
- D. $x=2$ only

Answer key

1. **D** - $2^{x+1} = 2^5$, so $x+1=5$ and $x=4$. Setting $x=5$ forgets to subtract the 1.
2. **B** - $x = \frac{\ln 50}{\ln 3} \approx 3.561$. Dividing 50 by 3 or dividing $\ln 50$ by 3 ignores that the base must also be logged.
3. **B** - Divide by 5 first: $2^x = 8$, so $x=3$. Multiplying 5 by 2 gives the wrong value 4.
4. **C** - $x-1 = 3^2 = 9$, so $x=10$. The answer 9 forgets to add 1 back.
5. **D** - $x(x-2)=8$ gives $x=4$ or $x=-2$, but $x=-2$ makes a log argument negative, so it is extraneous.
6. **C** - $\ln x = 3$ means $x = e^3 \approx 20.09$. Multiplying $3e$ mixes up the exponent and the product.
7. **B** - $1.05^t = 2$, so $t = \frac{\ln 2}{\ln 1.05} \approx 14.21$. Dividing $\ln 2$ by 0.05 gives 13.86, which treats the rate as continuous.
8. **A** - From 80 to 10 takes 3 halvings, since $80 \rightarrow 40 \rightarrow 20 \rightarrow 10$. Three halvings take $3 \times 5 = 15$ days.
9. **D** - $3 = e^{\ln 3}$ and $\ln 3 \approx 1.099$, so $3^t = e^{1.099t}$. Using $\log 3 \approx 0.477$ is the wrong base.
10. **A** - Let $u = 2^x$: $u^2 - 5u + 4 = 0$ gives $u=1$ or $u=4$, so $x=0$ or $x=2$. The values 1 and 4 are u , not x .

Remember:

- Standards F-LE.A.4 and A-SSE.B.3c: solve $ab^{ct} = d$ with logarithms and rewrite exponential expressions.
- To solve $b^x = k$, take logs: $x = \frac{\ln k}{\ln b}$.
- To solve $\log_b x = c$, rewrite it as $x = b^c$; then check that every log argument is positive.
- Compound interest $A = P(1 + \frac{r}{n})^{nt}$, continuous growth $A = Pe^{rt}$ and half-life $N = N_0(\frac{1}{2})^{t/h}$ all reduce to exponential equations.
- Rewrite b^t as $e^{t \ln b}$ or $(b^{1/12})^{12t}$ to show a different growth rate.