

Precalculus - Exponential and Logarithmic Equations - Test Answer Key

Common Core F-LE.A.4, F-BF.B.5, A-REI.D.11 · maths-pdf.fr/en/

Worked solutions and scoring notes for the 9-question exponential and logarithmic equations test. Use the scoring line under each solution to award partial credit.

Precalculus · Common Core State Standards: **F-LE.A.4, F-BF.B.5, A-REI.D.11**

Question 1 - Exponential equations [2 pts]

(a) $81 = 3^4$, so $x+2=4$. (b) $x = \frac{\ln 50}{\ln 7} \approx 2.010$.

(a) $x=2$; **(b)** $x \approx 2.010$

Scoring: 1 point each.

Question 2 - Base e equation [2 pts]

$3x = \ln 20$, so $x = \frac{\ln 20}{3} \approx 0.999$.

$x \approx 0.999$

Scoring: 1 point for the log step, 1 point for the value.

Question 3 - Isolate the power [2 pts]

$2^x = 14$, so $x = \frac{\ln 14}{\ln 2} \approx 3.807$.

$x \approx 3.807$

Scoring: 1 point for isolating, 1 point for the value.

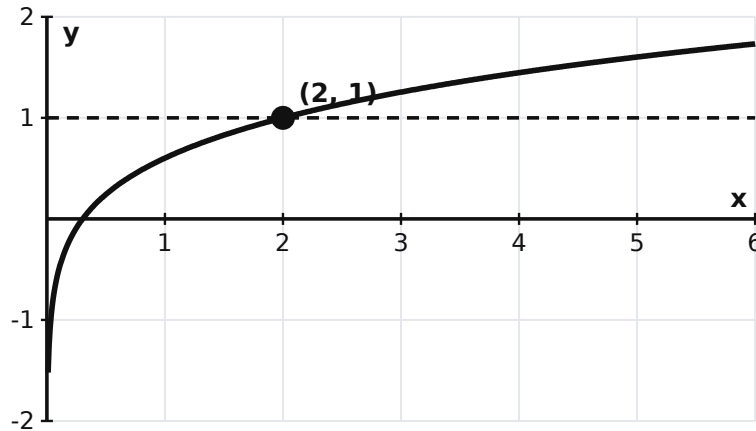
Question 4 - Log equation [2 pts]

$2x-1=3^2=9$, so $x=5$.

$x=5$

Scoring: 1 point for the exponential form, 1 point for x .

Question 5 - Combine and check [3 pts]



The graphs meet at $x = 2$.

(a) $\log(x(x+3))=1$. (b) $x^2+3x=10$, $(x+5)(x-2)=0$. (c) $x=-5$ makes $\log(-5)$ undefined, so reject it; $\log 2 + \log 5 = \log 10 = 1$.

$$x=2$$

Scoring: 1 point for each part.

Question 6 - Two logs equal [2 pts]

$x(x-2)=15$, so $x^2-2x-15=0$ and $(x-5)(x+3)=0$. Reject $x=-3$.

$$x=5$$

Scoring: 1 point for the equation, 1 point for rejecting -3.

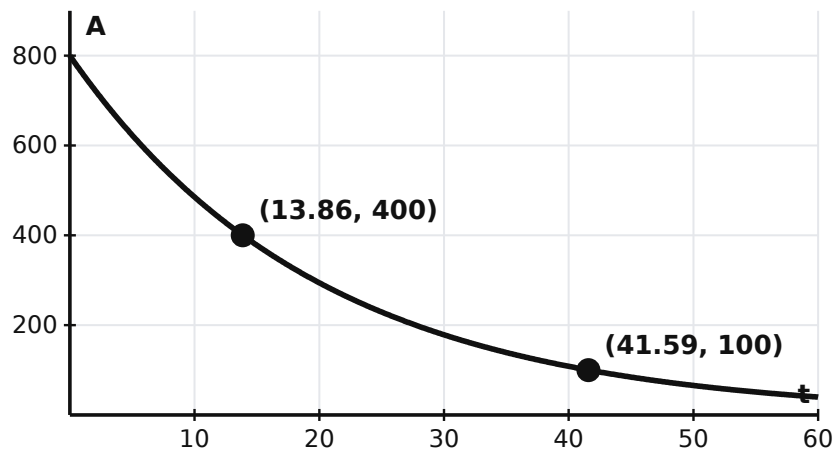
Question 7 - Savings goal [2 pts]

$$1.04^t = 1.6, t = \frac{\ln 1.6}{\ln 1.04} \approx 11.98.$$

11.98 years

Scoring: 1 point for the equation, 1 point for t .

Question 8 - Radioactive decay [3 pts]



Half the mass at $t = 13.86$; one eighth at 41.59.

(a) $800e^{-0.5} \approx 485.2$. (b) $e^{-0.05t} = \frac{1}{2}$, $t = \frac{\ln 2}{0.05} \approx 13.86$. (c) $e^{-0.05t} = \frac{1}{8}$, $t = \frac{\ln 8}{0.05} \approx 41.59$.

485.2 g; 13.86 days; 41.59 days

Scoring: 1 point for each part.

Question 9 - Different bases [2 pts]

$(x-1)\ln 3 = x\ln 2$, so $x(\ln 3 - \ln 2) = \ln 3$ and $x = \frac{\ln 3}{\ln 1.5} \approx 2.710$.

$x \approx 2.710$

Scoring: 1 point for the setup, 1 point for the value.

Total

20 points