Solving exponential equations with base-10 logs

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. Solve $8^x = 12$ to four decimal places. [2 marks]

$x = \log 12 / \log 8$.

Answer: x approximately 1.1950

2. Solve $2^{x+3} = 7$ to four decimal places. [2 marks]

$x + 3 = \log 7 / \log 2$, then subtract 3.

Answer: x approximately -0.1926

3. Solve $4(1.2)^t = 10$ to three decimal places. [2 marks]

Isolate $(1.2)^t = 2.5$; use $t = \log 2.5 / \log 1.2$.

Answer: t approximately 5.026

4. A 600-unit quantity grows by 8% at the end of each year. In which completed year does it first exceed 1000? [3 marks]

$t > \log(1000/600) / \log 1.08 \approx 6.637$.

Year 7 is the first integer year; substitution verifies the threshold.

Answer: 7

5. Solve $(0.8)^t < 0.3$ for real t. [3 marks]

Take logs and divide by $\log 0.8 < 0$, reversing the inequality.

Answer: $t > \log 0.3 / \log 0.8 \approx 5.396$

6. Can $2^x = -3$ have a real solution? Explain. [2 marks]

2^x is positive for every real x, so it cannot equal a negative number.

Answer: No.