Checking domains and the reasonableness of model predictions

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. Find the domain of $\log(5-2x)$. [2 marks]

Require 5-2x>0.

Answer: $x < 2.5$

2. Find the domain of $\log x + \log(x-4)$. [2 marks]

Both arguments must be positive.

Answer: $x > 4$

3. Solve $\log(x+2) = \log(3x-4)$ and check its domain. [3 marks]

Domain x>4/3; equate arguments: x+2=3x-4, so x=3.

At x=3 both arguments equal 5.

Answer: x=3

4. A model is $V(t) = 900(0.8)^t$ for an asset bought at t=0. Explain why t=-2 is not a prediction of its resale value after purchase. [2 marks]

The formula is mathematically defined at -2, but the stated post-purchase context uses t at least zero.

Answer: It refers to two years before purchase.

5. A population model gives 47.826 individuals. How should a reported prediction be written, and why? [2 marks]

Individuals are counted in whole numbers. The unrounded value is useful in calculations but not as a literal count.

Answer: About 48 individuals, with the model assumptions stated.

6. A student solves $\log x + \log(x-3) = 1$ and gives x=-2 because the combined product is 10. Explain precisely why this is invalid. [3 marks]

Although their product is positive, neither original logarithm is real. Original domain x>3 excludes -2.

Answer: The original arguments -2 and -5 are not positive.