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 $x>\frac{4}{3}$; 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.