Writing Exponential Functions from Tables and Graphs: A Structured Guide

Original tasks 1, 2, 3, 4 / complete keys

Task 1

Table: (0, 2), (1, 6), (2, 18), (3, 54). Write the exponential function.

Answer: $y = 2 \cdot 3^x$

Reason: At $x = 0$, $y = 2$, so $a = 2$. Ratio $6/2 = 3$, $18/6 = 3$, $54/18 = 3$, so $b = 3$. Function: $y = 2 \cdot 3^x$. Check $x = 2$: $2 \cdot 3^2 = 18$, matches.

Check: Substitute $x = 3$: $2 \cdot 3^3 = 54$, matches table.

Task 2

Table: (1, 12), (2, 6), (3, 3), (4, 1.5). Write the exponential function.

Answer: $y = 24 \cdot (1/2)^x$

Reason: Ratio $6/12 = 1/2$, $3/6 = 1/2$, $1.5/3 = 1/2$, so $b = 1/2$. Use point (1, 12): $12 = a \cdot (1/2)^1 \rightarrow a = 24$. Function: $y = 24 \cdot (1/2)^x$. Check $x = 2$: $24 \cdot (1/2)^2 = 6$, matches.

Check: Substitute $x = 4$: $24 \cdot (1/2)^4 = 1.5$, matches table.

Task 3

Graph description: A smooth curve crosses the y-axis at (0, 4) and passes through (1, 10) and (2, 25). Write the exponential function.

Answer: $y = 4 \cdot 2.5^x$

Reason: y-intercept gives $a = 4$. Using (1, 10): $10 = 4 \cdot b^1 \rightarrow b = 2.5$. Check with (2, 25): $4 \cdot 2.5^2 = 4 \cdot 6.25 = 25$, matches. Function: $y = 4 \cdot 2.5^x$.

Check: Substitute $x = 1$: $4 \cdot 2.5 = 10$, matches graph point.

Task 4

Graph description: A decaying curve crosses the y-axis at (0, 8) and passes through (1, 4) and (2, 2). Write the exponential function.

Answer: $y = 8 \cdot (1/2)^x$

Reason: y-intercept gives $a = 8$. Using (1, 4): $4 = 8 \cdot b^1 \rightarrow b = 1/2$. Check with (2, 2): $8 \cdot (1/2)^2 = 2$, matches. Function: $y = 8 \cdot (1/2)^x$.

Check: Substitute $x = 2$: $8 \cdot (1/2)^2 = 2$, matches graph point.

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Source rubric / reflection

- [ ] Correctly identifies the initial value a from x = 0 or by back-substitution.
- [ ] Computes the constant ratio b accurately and confirms it is constant.
- [ ] Writes the function in the form y = a · b^x.
- [ ] Verifies with a check point not used to find a or b.
- [ ] Explains reasoning clearly and uses consistent units.

Reflection: What did you check, what did you change, and what will you try next?