Exponential & Logarithmic Functions Error Analysis

Find the mistake. Explain it. Fix it.

Name: _____ Period: _____ Date: _____

1. Log of a sum

ORIGINAL PROBLEM

Evaluate $\log_2(8 + 8)$ without a calculator.

INCORRECT WORKED SOLUTION

$\log_2(8 + 8)$

$= \log_2 8 + \log_2 8$

$= 3 + 3$

$= 6$

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)

2. Log form to exponential form

ORIGINAL PROBLEM

Solve $\log_4 x = 3$.

INCORRECT WORKED SOLUTION

$\log_4 x = 3$

$x = 4 \cdot 3$

$x = 12$

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)

Scoring: Explanation = 1 point • Correct work/answer = 1 point • Total = 20 points

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3. Fractional base

ORIGINAL PROBLEM

Evaluate $\log_{\frac{1}{3}} 9$ without a calculator.

INCORRECT WORKED SOLUTION

Let $y = \log_{\frac{1}{3}} 9$

$(\frac{1}{3})^y = 9$

$9 = 3^2$

$y = 2$

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)

4. Power property

ORIGINAL PROBLEM

Write $3 \log_2 x - \log_2 5$ as a single logarithm.

INCORRECT WORKED SOLUTION

$3 \log_2 x - \log_2 5$

$= \log_2 3x - \log_2 5$

$= \log_2 \frac{3x}{5}$

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)

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5. Rounding too early

ORIGINAL PROBLEM

An investment grows continuously: $A = Pe^{0.05t}$. How many years until it triples? Round to the nearest hundredth.

INCORRECT WORKED SOLUTION

$3P = Pe^{0.05t}$

$3 = e^{0.05t}$

$\ln 3 = 0.05t$

$1.1 = 0.05t$

$t = 22$

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)

6. Change of base

ORIGINAL PROBLEM

Evaluate $\log_5 40$. Round to the nearest thousandth.

INCORRECT WORKED SOLUTION

$$\log_5 40 = \frac{\log 5}{\log 40}$$

$$\approx \frac{0.699}{1.602}$$

≈ 0.436

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)

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7. Same base: distribute the exponent

ORIGINAL PROBLEM

Solve $4^{x+1} = 8^{x-1}$.

INCORRECT WORKED SOLUTION

$(2^2)^{x+1} = (2^3)^{x-1}$

$2^{2x+1} = 2^{3x-3}$

$2x + 1 = 3x - 3$

$x = 4$

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)

8. Isolate the exponential first

ORIGINAL PROBLEM

Solve $2 \cdot 3^x = 50$. Round to the nearest hundredth.

INCORRECT WORKED SOLUTION

$2 \cdot 3^x = 50$

$6^x = 50$

$x = \frac{\log 50}{\log 6}$

$x \approx 2.18$

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)

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9. Extraneous solution

ORIGINAL PROBLEM

Solve $\log_2 x + \log_2(x - 2) = 3$.

INCORRECT WORKED SOLUTION

$\log_2 [x(x - 2)] = 3$

$x(x - 2) = 2^3 = 8$

$x^2 - 2x - 8 = 0$

$(x - 4)(x + 2) = 0$

$x = 4$ or $x = -2$

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)

10. Compound interest

ORIGINAL PROBLEM

Find the value of $2,000 invested at 6% compounded quarterly for 5 years.

Use $A = P(1 + \frac{r}{n})^{nt}$. Round to the nearest cent.

INCORRECT WORKED SOLUTION

$A = 2000(1 + \frac{0.06}{4})^5$

$A = 2000(1.015)^5$

$A \approx \$2{,}154.57$

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)

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