Functions & Transformations Error Analysis

Find the mistake. Explain it. Fix it.

Name: _____ Period: _____ Date: _____

1. Horizontal shift sign

ORIGINAL PROBLEM

The graph of $f(x) = |x|$ (dashed) is transformed to $g(x) = |x + 3| - 2$. State the vertex of g and graph it.

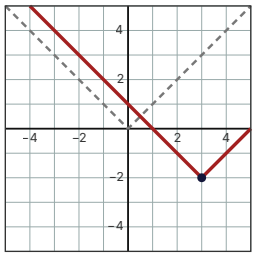
INCORRECT WORKED SOLUTION

$g(x) = |x + 3| - 2$

The +3 means move 3 units right.

The −2 means move 2 units down.

Vertex: (3, −2)

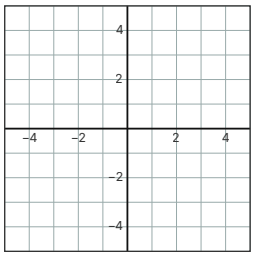


Dashed: $f(x)$. Solid: student's graph.

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)



Sketch the correct graph on this grid.

2. Function notation: $f(x + k)$ vs $f(x) + k$

ORIGINAL PROBLEM

Let $f(x) = x^2 - 3x$. Find and simplify $f(x + 2)$.

INCORRECT WORKED SOLUTION

$f(x + 2) = f(x) + 2$

$= x^2 - 3x + 2$

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. Reflections: $-f(x)$ vs $f(-x)$

ORIGINAL PROBLEM

The graph of $f(x) = \sqrt{x + 3}$ is dashed. Graph $h(x) = f(-x)$.

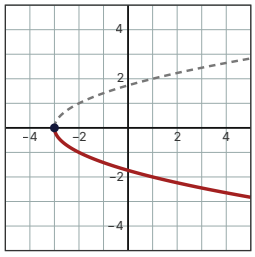
INCORRECT WORKED SOLUTION

$h(x) = f(-x)$

The negative changes the sign of every output,

so $h(x) = -\sqrt{x + 3}$.

Reflect f in the x-axis.

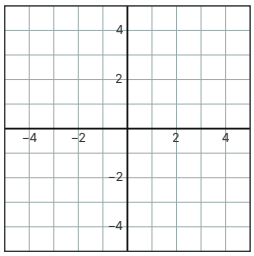


Dashed: $f(x)$. Solid: student's graph.

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)



Sketch the correct graph on this grid.

4. Domain: square root and denominator

ORIGINAL PROBLEM

Find the domain of $h(x) = \dfrac{\sqrt{x + 2}}{x - 4}$. Write it in interval notation.

INCORRECT WORKED SOLUTION

$x + 2 \geq 0$

$x \geq -2$

Domain: $[-2, \infty)$

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. Horizontal compression: $f(2x)$

ORIGINAL PROBLEM

The graph of $f(x) = x^2 - 4$ is dashed. Graph $g(x) = f(2x)$ and list its x-intercepts.

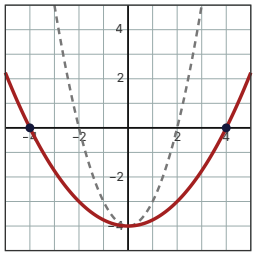
INCORRECT WORKED SOLUTION

$g(x) = f(2x)$

The 2 stretches the graph horizontally by a factor of 2,

so each x-value doubles:

$(-2, 0) \to (-4, 0)$ and $(2, 0) \to (4, 0)$

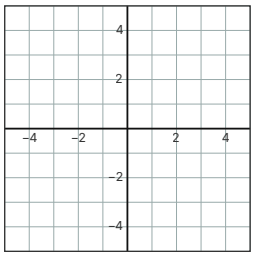


Dashed: $f(x)$. Solid: student's graph.

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)



Sketch the correct graph on this grid.

6. Composition order (modeling)

ORIGINAL PROBLEM

A jacket costs \$95. A \$15 coupon is applied first, $C(p) = p - 15$, and then a 20% discount, $D(p) = 0.8p$. Find the final price using $(D \circ C)(95)$.

INCORRECT WORKED SOLUTION

$(D \circ C)(95) = C(D(95))$

$= C(0.8 \cdot 95) = C(76)$

$= 76 - 15 = \$61$

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. Inverse notation: f^{-1} is not a reciprocal

ORIGINAL PROBLEM

Let $f(x) = 5 - 3x$. Find $f^{-1}(-7)$.

INCORRECT WORKED SOLUTION

$$f^{-1}(-7) = \frac{1}{f(-7)}$$

$$f(-7) = 5 - 3(-7) = 26$$

$$f^{-1}(-7) = \frac{1}{26}$$

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)

8. Inverse graph: reflect in $y = x$

ORIGINAL PROBLEM

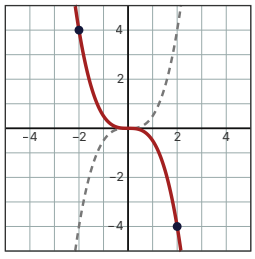
The graph of $f(x) = \frac{x^3}{2}$ is dashed. Graph $f^{-1}(x)$.

INCORRECT WORKED SOLUTION

An inverse "undoes" f, so it flips the outputs:

$(x, y) \to (x, -y)$, so $(2, 4) \to (2, -4)$

$$f^{-1}(x) = -\frac{x^3}{2}$$

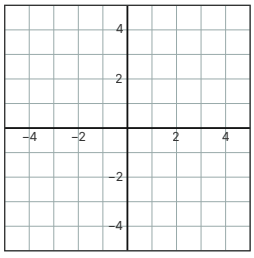


Dashed: $f(x)$. Solid: student's graph.

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)



Sketch the correct graph on this grid.

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

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9. Piecewise: boundary points

ORIGINAL PROBLEM

Graph f and find $f(1)$.
$f(x) = x + 2$ for $x < 1$
$f(x) = x^2 - 2$ for $x \geq 1$

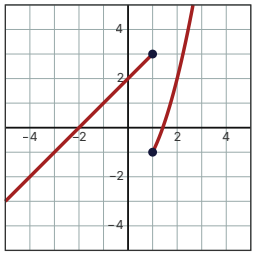
INCORRECT WORKED SOLUTION

Left piece at $x = 1$: $1 + 2 = 3$

Right piece at $x = 1$: $1^2 - 2 = -1$

Closed dot at (1, 3) and closed dot at (1, −1)

So $f(1) = 3$ and $f(1) = -1$.

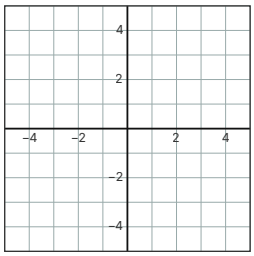


Student's graph.

A. EXPLAIN THE MISTAKE (1 POINT)

Describe exactly which step is wrong and why.

B. SHOW CORRECT WORK (1 POINT)



Sketch the correct graph on this grid.

10. Order of transformations

ORIGINAL PROBLEM

The point (3, −2) is on the graph of $y = f(x)$. Find the corresponding point on $y = -2f(x + 1) + 3$.

INCORRECT WORKED SOLUTION

x: $x + 1 = 3$, so $x = 2$

y: $-2 + 3 = 1$

then $1 \cdot (-2) = -2$

Point: (2, −2)

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