Classroom Voting Questions: Precalculus

New Functions From Old: Compositions, Inverses, and Transforms

1. The functions $f$ and $g$ have values given in the table below. What is the value of $f(g(0))$?

<table>
<thead>
<tr>
<th>$x$</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>1</td>
<td>0</td>
<td>-2</td>
<td>2</td>
<td>-1</td>
</tr>
<tr>
<td>$g(x)$</td>
<td>-1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>-2</td>
</tr>
</tbody>
</table>

(a) -2  
(b) -1  
(c) 0   
(d) 1   
(e) 2

2. The functions $f$ and $g$ have values given in the table below. If $f(g(x)) = 1$, then what is $x$?

<table>
<thead>
<tr>
<th>$x$</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>1</td>
<td>0</td>
<td>-2</td>
<td>2</td>
<td>-1</td>
</tr>
<tr>
<td>$g(x)$</td>
<td>-1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>-2</td>
</tr>
</tbody>
</table>

(a) -2  
(b) -1  
(c) 0   
(d) 1   
(e) 2

3. The graphs of $f$ and $g$ are shown in the figure below. Estimate the value of $g(f(3))$. 

1
4. The graphs of $f$ and $g$ are shown in the figure below. Estimate the value of $f(g(2))$.

(a) -1
(b) 0
(c) 1
(d) 2
(e) 3
(f) 5
5. If \( P = f(t) = 3 + 4t \), find \( f^{-1}(P) \).

(a) \( f^{-1}(P) = 3 + 4P \)
(b) \( f^{-1}(P) = \frac{P-3}{4} \)
(c) \( f^{-1}(P) = \frac{P+4}{3} \)
(d) \( f^{-1}(P) = 4(P + 3) \)
(e) \( f^{-1}(P) = \frac{P+3}{4} \)

6. Which of these functions has an inverse?

(a) (a) only
(b) (b) only
(c) (c) only
(d) (d) only
(e) (a) and (b)
(f) (b) and (c)

7. The following is a graph of \( f(x) \). Which graph below is the inverse?
8. Given that \( f(x) = \sqrt[5]{\frac{x^3 - 72}{800}} \), find \( f \circ f^{-1}(437) \).

(a) 104,316.73  
(b) 1671.2  
(c) 437  
(d) 10.08

9. If \( f(x) = \frac{x}{x^2 + 1} \), what is \( f^{-1} \circ f(-2) \)?

(a) \(-\frac{2}{3}\)  
(b) \(\frac{2}{3}\)  
(c) \(-\frac{5}{2}\)  
(d) \(-2\)

10. If \((4, -2)\) is a point on the graph of \( y = f(x) \), which of the following points is on the graph of \( y = f^{-1}(x) \)?
(a) \((-2, 4)\)
(b) \((-4, 2)\)
(c) \(\left(\frac{1}{4}, -\frac{1}{2}\right)\)
(d) \(\left(-\frac{1}{4}, \frac{1}{2}\right)\)

11. Find the inverse of \(f(x) = \frac{1}{x}\).

(a) \(f^{-1}(x) = \frac{x}{1}\)
(b) \(f^{-1}(x) = x\)
(c) \(f^{-1}(x) = \frac{1}{x}\)
(d) \(f^{-1}(x) = xy\)

12. A function is given in Figure 1.10 below. Which one of the other graphs could be a graph of \(f(x + h)\)?
13. How is the graph of \( y = 2^{x-1} + 3 \) obtained from the graph of \( y = 2^x \)?

(a) Move 1 down and 3 right
(b) Move 1 left and 3 up
(c) Move 1 up and 3 right
(d) Move 1 right and 3 up
14. The function \( f(x) \) goes through the point \( A \) with coordinates \((2, 3)\). \( g(x) = 2f(\frac{1}{3}x - 2) + 4 \). What are the coordinates of point \( A \) in the function \( g(x) \)?

(a) \((4, 10)\)
(b) \((4, -\frac{5}{2})\)
(c) \((12, 10)\)
(d) \((-\frac{4}{3}, 10)\)
(e) \((-\frac{4}{3}, -\frac{5}{2})\)

15. The point \((4, 1)\) is on the graph of a function \( f \). Find the corresponding point on the graph of \( y = f(x - 2) \).

(a) \((6, 1)\)
(b) \((2, 1)\)
(c) \((4, 3)\)
(d) \((4, -1)\)

16. The point \((6, 1)\) is on the graph of a function \( f \). Find the corresponding point on the graph of \( y = f(2x) \).

(a) \((12, 1)\)
(b) \((3, 1)\)
(c) \((6, 2)\)
(d) \((6, \frac{1}{2})\)

17. Given the graph of a function \( f(x) \), what sequence of activities best describes the process you might go through to graph \( g(x) = 5f(-x) \)?

(a) Expand the graph by a factor of 5, then reflect it across the \( y \)-axis.
(b) Expand the graph by a factor of 5, then reflect it across the \( x \)-axis.
(c) Reflect the graph across the \( y \)-axis, then expand it by a factor of 5.
(d) Reflect the graph across the \( x \)-axis, then expand it by a factor of 5.
(e) More than 1 of the above.
(f) None of the above.
18. Given the graph of a function \( f(x) \), what sequence of activities best describes the process you might go through to graph \( g(x) = -f(x) + 2 \)?

(a) Move the graph up 2 units, then reflect it across the \( x \)-axis.
(b) Move the graph up 2 units, then reflect it across the \( y \)-axis.
(c) Reflect the graph across the \( y \)-axis, then move it up by 2 units.
(d) Reflect the graph across the \( x \)-axis, then move it up 2 units.
(e) More than 1 of the above.
(f) None of the above.

19. Take the function \( f(x) \) and “Shift the function right \( h \) units. Reflect the result across the \( y \)-axis, then reflect the result across the \( x \)-axis. Finally shift the result up \( k \) units.” The end result is:

(a) \( f(x + h) + k \)
(b) \( f(x - h) + k \)
(c) \( -f(-x - h) + k \)
(d) \( -f(-x + h) + k \)

20. Given \( f(x) = x + 1 \) and \( g(x) = 3x^2 - 2x \), what is the composition \( g(f(x)) \).

(a) \( 3x^2 - 2x + 1 \)
(b) \( (3x^2 - 2x)(x + 1) \)
(c) \( 3x^2 + 4x + 1 \)
(d) \( 3(x + 1)^2 - 2x \)

21. Write \( h(x) = e^{3x/2} \) as a composition of functions: \( f(g(x)) \). \( f(x) = \) ____________, \( g(x) = \) ____________

(a) \( e^x, 3x/2 \)
(b) \( 3x/2, e^x \)
(c) \( x, e^{3x/2} \)
(d) \( x/2, 3e^x \)

22. If \( f(x) = x^2 + 6 \) and \( g(x) = x - 3 \), what is \( f \circ g(x) \)?

(a) \( x^2 + 3 \)
(b) \(x^2 - 6x + 15\)
(c) \(x^2 - 3\)
(d) \(x^3 - 3x^2 + 6x - 18\)

23. Which of the following functions IS invertible?

(a) \(f(x) = -x^4 + 7\)
(b) \(g(x) = e^{3x/2}\)
(c) \(h(x) = \cos(x)\)
(d) \(k(x) = |x|\)

24. Let \(f(x) = x - 2\) and \(g(x) = 3 - x^2\). Find \(g(f(2))\).

(a) -3
(b) 0
(c) 3
(d) 2

25. If \(P = f(t) = 3 + 4t\), find \(f^{-1}(7)\).

(a) 31
(b) \(\frac{1}{7}\)
(c) 0
(d) 1

26. Let \(f(x) = x^2\) and \(g(x) = x + 2\). True or false? The domain of the function \(\frac{f}{g}\) is \(\mathbb{R}\), all real numbers.

(a) True, and I am very confident.
(b) True, but I am not very confident.
(c) False, but I am not very confident.
(d) False, and I am very confident.

27. Let \(f(x) = x^2 - 4\) and \(g(x) = \sqrt{x}\). Find \((g \circ f)(x)\) and the domain of \(g \circ f\).
(a) $\sqrt{x^2 - 4}$; Domain: $(-\infty, -2] \cup [2, \infty)$
(b) $x - 4$; Domain: $\mathbb{R}$
(c) $x - 4$; Domain: $[0, \infty)$
(d) $\sqrt{x^2 - 4}$; Domain: $[0, \infty)$
(e) $\sqrt{x(x^2 - 4)}$; Domain: $[0, \infty)$