

# Advanced Function Language and Transformations

Function operations, composition, inverses, one-to-one behavior, and transformations.

Name \_\_\_\_\_ Date \_\_\_\_\_

32 main 2-up grid 2 pages

### Completion Reward



Shown here as a small pack artifact, not a preview destination.

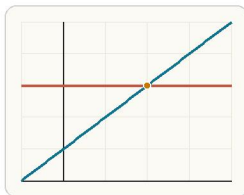
1. If  $f(3) = 11$ , what does that tell you?

x	f(x)
3	11
5	f(5)

The statement  $f(3) = 11$  means input 3 is paired with output 11.

- A. The slope of the graph is 11 at  $x = 3$ .
- B. The inverse sends 11 to 3 automatically.
- C. The function has domain 11.
- D. The output is 11 when the input is 3.

2. What must be true if a function is one-to-one?



If a function is one-to-one, different inputs must produce different outputs, which appears as a graph hit at most once by a horizontal line.

- A. Every input must be positive.
- B. The graph must pass through the origin.
- C. The function must be linear.
- D. Different inputs produce different outputs.

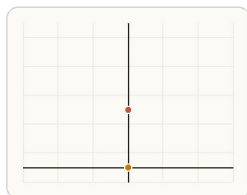
3. Which expression names the inverse function of  $f$ ?

x	f(x)	$1/f(x)$
2	5	$1/5$
4	9	$1/9$

The inverse function reverses the mapping, while a reciprocal changes the output value itself.

- A.  $f^{-1}(x)$
- B.  $1/f(x)$
- C.  $-f(x)$
- D.  $f(x - 1)$

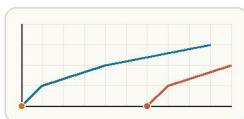
4. Compared to  $y = x^2$ , what does  $y = x^2 + 4$  do?



Adding 4 outside the quadratic raises every y-value by 4 without changing the horizontal shape.

- A. Shifts the graph right 4 units
- B. Shifts the graph up 4 units
- C. Reflects the graph over the x-axis
- D. Stretches the graph horizontally

5. Compared to  $y = \sqrt{x}$ , what does  $y = \sqrt{x - 6}$  do?



Subtracting inside the input shifts the whole graph to the right.

- A. Shifts the graph right 6 units
- B. Shifts the graph left 6 units
- C. Shifts the graph up 6 units
- D. Reflects the graph over the y-axis

6. What is the best first step to find the inverse of  $y = 3x + 7$ ?

original x	original y
0	7
2	13

Finding an inverse starts by swapping the input and output roles.

- A. Take the reciprocal of both sides.
- B. Swap x and y.
- C. Square both sides.
- D. Set y equal to 0.

7. A student says  $f^{-1}(x)$  always means  $1/f(x)$ . What is the mistake?

- A. They should multiply by x first.
- B. They should change the base of the function.
- C. Inverse function notation is not the same as reciprocal notation.
- D. They should always square the function.

8. If  $f(x) = 2x + 1$  and  $g(x) = x^2$ , find  $(f + g)(2)$ . Answer with a number.

9. If  $f(x) = 3x - 4$  and  $g(x) = x + 2$ , find  $(f - g)(5)$ . Answer with a number.

10. If  $f(x) = x + 1$  and  $g(x) = 2x$ , find  $(fg)(3)$ . Answer with a number.

11. If  $f(x) = x + 6$  and  $g(x) = 2x$ , find  $(f/g)(3)$ . Answer with a number.

12. If  $f(x) = 2x + 3$  and  $g(x) = x - 5$ , find  $f(g(8))$ . Answer with a number.

13. If  $f(x) = 2x + 3$  and  $g(x) = x - 5$ , find  $g(f(4))$ . Answer with a number.

14. If  $h(x) = x^2 - 1$ , find  $h(h(2))$ . Answer with a number.

15. If  $f(x) = x + 4$  and  $g(x) = x - 1$ , find  $(f/g)(5)$ . Answer with a number.

16. If  $f(x) = 2x - 1$ , find  $f^{-1}(9)$ . Answer with a number.

17. If  $g(x) = 5x + 2$ , find  $g^{-1}(17)$ . Answer with a number.

18. For  $h(x) = (x - 3)^2 + 1$ , find  $h(5)$ . Answer with a number.

19. For  $p(x) = -|x| + 4$ , find  $p(-2)$ . Answer with a number.
20. If  $f(x) = x + 1$  and  $g(x) = \sqrt{x}$ , find  $f(g(9))$ . Answer with a number.
21. If  $f(x) = 2x$  and  $g(x) = x + 5$ , find  $g(f(4))$ . Answer with a number.
22. If  $f(x) = x^2$  and  $g(x) = x + 1$ , find  $(f \circ g)(3)$ . Answer with a number.
23. If  $f(x) = x - 2$  and  $g(x) = 3x$ , find  $f(g(6))$ . Answer with a number.
24. If  $f(x) = 2x + 1$  and  $g(x) = x^2$ , write  $(f \circ g)(x)$ . Answer as an equation.
25. If  $f(x) = 5x - 2$  and  $g(x) = x + 4$ , write  $(f \circ g)(x)$ . Answer as an equation.
26. If  $f(x) = 3x - 1$  and  $g(x) = x^2$ , write  $f(g(x))$ . Answer as an equation.
27. If  $f(x) = 3x - 1$  and  $g(x) = x^2$ , write  $g(f(x))$ . Answer as an equation.
28. Find the inverse of  $f(x) = 2x + 5$ . Answer as an equation.
29. Find the inverse of  $g(x) = 4x - 3$ . Answer as an equation.
30. Write a function that shifts  $y = x^2$  right 3 units. Answer as an equation.
31. Write a function that reflects  $y = x^2$  across the x-axis. Answer as an equation.
32. Which student correctly writes  $f(g(x))$  when  $f(x) = x + 4$  and  $g(x) = 2x - 1$ ?
- A. Student A:  $f(g(x)) = (2x - 1) + 4$ .
- B. Student B:  $f(g(x)) = x + 4 + 2x - 1$  without substitution.
- C. Student C:  $f(g(x)) = 2(x + 4) - 1$ .
- D. Student D:  $f(g(x)) = 2x - 1 + 4x$ .