2.7B Composition of Functions (Part 2)

AP Precalculus

Solutions

2.7B Practice

Let $f(x) = x + 2$ and $g(x) = \frac{1}{x}$.

1. Find $f \circ g$

$f\left(\frac{1}{x}\right) = \frac{1}{x} + 2$

2. State the domain of $f \circ g$

$x \neq 0$

$(-\infty, 0) \cup (0, \infty)$

3. Find $g \circ f$

$g(x+2) = \frac{1}{x+2}$

4. State the domain of $g \circ f$

$x + 2 \neq 0$

$x \neq -2$

$(-\infty, -2) \cup (-2, \infty)$

Let $f(x) = \sqrt{4 - x}$ and $g(x) = x^2$.

5. Find $f \circ g$

$f(x^2) = \sqrt{4 - x^2}$

6. State the domain of $f \circ g$

$4 - x^2 \geq 0$

$x^2 \leq 4$

$[-2, 2]$

Let $f(x) = \sqrt{4-x}$ and $g(x) = x^2$.

7. Find $g \circ f$

$g(\sqrt{4-x}) = (\sqrt{4-x})^2$

$g \circ f = 4 - x$

8. State the domain of $g \circ f$

$4 - x \geq 0$

$-x \geq -4$

$x \leq 4$

$(-\infty, 4]$

Let $f(x) = \frac{3}{x^2}$ and $g(x) = \frac{1}{x}$.

9. Find $f \circ g$

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

$f \circ g = 3x^2$

10. State the domain of $f \circ g$

restriction on $g(x)$ is $x \neq 0$

$(-\infty, 0) \cup (0, \infty)$

11. Find $g \circ f$

$g\left(\frac{3}{x^2}\right) = \frac{1}{\frac{3}{x^2}} = \frac{x^2}{3}$

$g \circ f = \frac{x^2}{3}$

12. State the domain of $g \circ f$

restriction on $f(x)$ is $x \neq 0$

$(-\infty, 0) \cup (0, \infty)$

Express h as a composition of two simpler functions f and g where $h(x) = f(g(x))$.

13. $h(x) = (2x-7)^4$

$f(x) = x^4$

$g(x) = 2x - 7$

14. $h(x) = \frac{4}{\sqrt{x}+3}$

$f(x) = \frac{4}{x}$

$g(x) = \sqrt{x} + 3$

15. $h(x) = e^{x^3}$

$f(x) = e^x$

$g(x) = x^3$

16. $h(x) = \sqrt{x^2 - x}$

$f(x) = \sqrt{x}$

$g(x) = x^2 - x$

2.7B Composition of Functions (Part 2)

2.7B Test Prep

17. Given that $f(x) = cx - 3$ and $g(x) = cx + 5$ are both defined on the set of all real numbers and c is a constant, what is the value of c if $(f \circ g)(x) = (g \circ f)(x)$ for all values of x?

$$c(cx+5) - 3 = c(cx-3) + 5$$

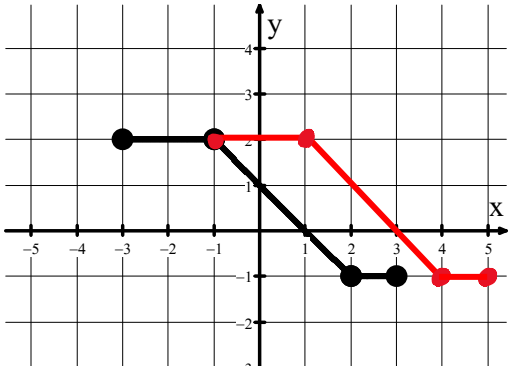
$$c^2x + 5c - 3 = c^2x - 3c + 5$$

$$5c - 3 = -3c + 5$$

$$8c = 8$$

$$\boxed{c = 1}$$

18. The piecewise-linear function f, defined on $-3 \le x \le 3$, is shown in the graph. The function g is given by $g(x) = x - 2$. Sketch a graph of $y = f(g(x))$.



Graph of f

$$y = f(x-2)$$

↑

This means shift the graph of $f(x)$ two units to the right. Although the domain restriction of f is $-3 \le x \le 3$, the domain restriction of $f(g(x))$ is $-1 \le x \le 5$. $g(x)$ has no restrictions, so it is a horizontal shift for the domain.