

4.3 NOTES APPLICATION

4.3 Operations with Functions

Notes

APPLICATION

For 1-2, use $f(x) = \sqrt{8-x}$ and $g(x) = \frac{5}{x}$

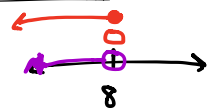
$$\begin{aligned} 1. \text{ Find } g(f(2)). &= \frac{5}{f(2)} \\ &= \frac{5}{\sqrt{8-(2)}} \\ &= \frac{5}{\sqrt{6}} \end{aligned}$$

2. Find $g(f(x))$ and state its domain.

$$g(f(x)) = \frac{5}{f(x)} = \frac{5}{\sqrt{8-x}}$$

$$\begin{array}{l} \text{RADICAND} \geq 0 \\ 8-x \geq 0 \\ -x \geq -8 \\ x \leq 8 \end{array}$$

$$\begin{array}{l} \text{Denom} \neq 0 \\ \sqrt{8-x} \neq 0 \\ 8-x \neq 0 \\ 8 \neq 0 \end{array}$$



D: $x \leq 8$

3. Given $f(x) = 3x$ and $g(x) = x+1$ and $h(x) = 2-x^3$ find the following.

$$\begin{aligned} \text{a. } (f+g)(2) &= f(2) + g(2) \\ &= 3(2) + (2)+1 \\ &= 6 + 3 \\ &= 9 \end{aligned}$$

$$\begin{aligned} \text{c. } (f \cdot g)(2) &= f(2) \cdot g(2) \\ &= 6 \cdot 3 \\ (f \cdot g)(2) &= 18 \end{aligned}$$

$$\begin{aligned} \text{d. } \left(\frac{h}{g}\right)(2) &= \frac{h(2)}{g(2)} \\ &= \frac{2-(2)^3}{(2)+1} \\ &= \frac{2-8}{3} \\ &= \frac{-6}{3} \\ &= -2 \end{aligned}$$

4. Suppose $f(x) = x^2 + bx - 7$ and $f(3) = 5$. Find b .

$$\begin{aligned} 5 &= (3)^2 + b(3) - 7 \\ 5 &= 9 + 3b - 7 \\ 5 &= 2 + 3b \\ 3 &= 3b \\ 1 &= b \end{aligned}$$

5. Given $f(x) = 2x - b$ while $g(x) = 3bx$. If $f(g(1)) = 25$ what is $g(f(1))$?

$$\begin{aligned}
 f(g(1)) &= 2(g(1)) - b & g(f(1)) &= 3(b)(f(1)) \\
 25 &= 2(3b(1)) - b & &= 15(2(1) - b) \\
 25 &= 6b - b & &= 15(2 - b) \\
 25 &= 5b & &= 15(-3) \\
 5 &= b & g(f(1)) &= -45
 \end{aligned}$$

6. Given that $f(x) = cx - 8$ 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 ?

$$\begin{aligned}
 f(g(x)) &= c(g) - 8 \\
 &= c(cx + 5) - 8 \\
 f(g(x)) &= c^2x + 5c - 8
 \end{aligned}$$

$$\begin{aligned}
 g(f(x)) &= c(f) + 5 \\
 &= c(cx - 8) + 5 \\
 g(f(x)) &= c^2x - 8c + 5
 \end{aligned}$$

$$\begin{aligned}
 c^2x + 5c - 8 &= c^2x - 8c + 5 \\
 5c - 8 &= -8c + 5 \\
 13c &= 13 \\
 c &= 1
 \end{aligned}$$

7. Use the two tables given to fill in the incomplete table.

x	$f(x)$
-2	3
-1	1
0	5
1	0
2	4
3	-2
4	2
5	-1

x	$g(x)$
-2	1
-1	5
0	2
1	-2
2	3
3	-1
4	4
5	0

x	$(f+g)(x)$
-2	4
-1	6
0	7
1	-2
2	7
3	-3
4	6
5	-1

8. Fill in the following table, given that $h(x) = (f \circ g)(x)$

x	$g(x)$	$f(x)$	$h(x)$
-3	0	8	20
-2	-3	5	8
-1	2	7	11
0	-2	20	5
1	1	9	9
2	-1	11	7
3	3	31	31