CHAPTER 2.7

Combining Functions

Multiple-Choice Old Exam Questions

24 questions • 3 topics • options A–E • two questions per page

Topic 1 | Domains and Quotients of Functions

Finding the domain of a quotient or a composition, and evaluating a quotient • Questions 1–8

Q **1**

If $f(x) = \sqrt{x}$ and $g(x) = \sqrt{9 - x^2}$, then the domain of the function $\left(\frac{f}{g}\right)(x)$, in interval notation, is

A) $[0, 3)$

B) $(-3, 0)$

C) $(-3, 3)$

D) $[0, 3]$

E) $(-3, 0]$

Q **2**

If $f(x) = \sqrt{16 - x^2}$ and $g(x) = x^2 - 7x + 12$, then the domain of the function $\frac{f}{g}$ is

A) $[-4, 3) \cup (3, 4)$

B) $[-4, 3) \cup (3, 4]$

C) $[-4, -3] \cup (-3, 4)$

D) $[-4, 4]$

E) $(-\infty, -4] \cup [4, \infty)$

Q
3

If $f(x) = \sqrt{x+1}$ and $g(x) = x^2 + 2x$, then the domain of $\frac{f}{g}$ is

A) $[-1, 0) \cup (0, \infty)$

B) $(-2, -1] \cup [1, \infty)$

C) $[-1, 0)$

D) $(-2, -1] \cup (0, \infty)$

E) $[-1, \infty)$

Q
4

If $f(x) = \sqrt[4]{x+1}$, $g(x) = x^3 + 2x^2 + x$, and the domain of $\frac{f}{g}$ is $(a, b) \cup (b, \infty)$, then $a + b =$

A) -1

B) 0

C) 1

D) -2

E) 2

Q
5

If $f(x) = \frac{x}{x+1}$ and $g(x) = \frac{x-2}{2x+4}$, then the domain of the function $\frac{f}{g}$ is

A) $(-\infty, \infty)$

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

C) $(-\infty, -1) \cup (-1, 2) \cup (2, \infty)$

D) $(-\infty, -2) \cup (-2, -1) \cup (-1, 2) \cup (2, \infty)$

E) $(-\infty, 1) \cup (1, 2) \cup (2, \infty)$

Q
6

If $f(x) = \frac{x-1}{3-x}$ and $g(x) = \sqrt{x+2}$, then the domain of $(f \circ g)(x)$ is

A) $[-2, 7) \cup (7, \infty)$

B) $(3, \infty)$

C) $[-2, \infty)$

D) $[-2, 3)$

E) $[-2, 3) \cup (3, \infty)$

Q
7

The domain of $(g \circ f)(x)$, where $f(x) = \frac{2}{x}$ and $g(x) = \sqrt{x-3}$, is

A) $\left(0, \frac{2}{3}\right]$

B) $(-\infty, 0) \cup \left[\frac{2}{3}, \infty\right)$

C) $(-\infty, \infty)$

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

E) $\left[0, \frac{2}{3}\right]$

Q
8

If $f(x) = x^3$ and $g(x) = |x-1|$, then $\left(\frac{f}{g}\right)(\sqrt{2})$ is equal to

A) $2 + 2\sqrt{2}$

B) $4 + 2\sqrt{2}$

C) $2 + \sqrt{2}$

D) $4 - 2\sqrt{2}$

E) $2\sqrt{2} - 2$

Topic 2 | Evaluating Combined and Piecewise Functions

Evaluating sums, products and compositions, including piecewise and greatest integer functions • Questions 9–16

Q **9**

Which one of the following is TRUE for the functions $f(x) = 3x + 2$ and $g(x) = \frac{1}{3}x - \frac{2}{3}$?

A) $(f - g)(-1) = 0$

B) $(f \cdot g)(1) = 5$

C) $(g + f)(3) = \frac{35}{3}$

D) $(g \circ f)(2) \neq (f \circ g)(2)$

E) $\left(\frac{f}{g}\right)(0)$ is undefined.

Q **10**

If $f(x) = \sqrt{16 + \sqrt{x}}$, then $(f \circ f)(0)$ is equal to

A) 9

B) $2\sqrt{3}$

C) $3\sqrt{2}$

D) 8

E) 4

Q
11

If $f(x) = \begin{cases} 2x - 1 & \text{if } x \leq -1 \\ 2x + 3 & \text{if } x > -1 \end{cases}$ and $g(x) = [[x]]$, where $[[\cdot]]$ is the greatest integer function, then the value of $(f \circ g)(-0.3) + \sqrt{(f \cdot g)(0.5)}$ is equal to

A) -3

B) -4

C) -1

D) -2

E) 1

Q
12

Let $[[x]]$ denote the greatest integer function and let $f(x) = \begin{cases} \frac{1}{5}([[x]] - 1) & \text{if } x \leq -1 \\ 1 - [[x]] & \text{if } x > -1 \end{cases}$. Then the value of $(f \circ f)\left(-\frac{3}{2}\right)$ is equal to

A) 0.2

B) 0.36

C) 2

D) -0.2

E) 0

Q
13

If $f(x) = \begin{cases} [[x-1]] & \text{if } x > -2 \\ |x| & \text{if } -4 \leq x \leq -2 \\ -3 & \text{if } x < -4 \end{cases}$, where $[[\cdot]]$ denotes the greatest integer function, then $(f \circ f)\left(-\frac{3}{2}\right) + f(-5) =$

A) 0

B) -4

C) 3

D) -2

E) 4

Q
14

If $f(x) = -x^2 + 3x + 1$ and $g(x) = [[x-3]]$, then $(f \circ g)(2\pi) =$

A) 17

B) -17

C) 13

D) 1

E) 19

Q
15

Given the function $f(x) = \begin{cases} [[x+1]] & \text{if } x \geq 0 \\ |x| - 1 & \text{if } x < 0 \end{cases}$, where $[[\cdot]]$ denotes the greatest integer function, then $(f \circ f)(-\pi) =$

A) 3

B) 2

C) 4

D) 1

E) 5

Q
16

If $(f \circ g)(x) = x^2 + \frac{1}{x^2} - 4$ and $g(x) = x - \frac{1}{x}$, then $f(3) =$

A) 7

B) 5

C) 9

D) 3

E) 11

Topic 3 | Finding Functions, Parameters and Inputs

Using a given composition to find a function value, a formula, a parameter or an input • Questions 17–24

Q **17**

If $f(x) = 1 - 3x$ and $(f \circ g)(x) = 3x^3 - x^2 + 2$, then $g(-1) =$

A) 1

B) -1

C) $\frac{5}{3}$

D) -4

E) 4

Q **18**

If $f(x) = 2x^2 + 5$, $g(x) = 2x + m$, and the graph of the function $(f \circ g)(x)$ has y-intercept 23, then $m =$

A) ± 3

B) $\pm\sqrt{7}$

C) -5

D) 5

E) ± 7

Q
19

If $g(x) = 4x - 5$ and $(g \circ f)(x) = 8x^2 + 12x - 1$, then $f(-2)$ is equal to

A) 3

B) 7

C) 15

D) -7

E) -13

Q
20

If $f(x) = 2x - 1$ and $(f \circ g)(x) = 2x + 1$, then $g(x)$ is equal to

A) -2

B) $2x + 2$

C) 2

D) $x + 2$

E) $x + 1$

Q
21

If $(f \circ g)(x) = 10 - x$, $f(x) = 2x + 4$ and $g(x) = ax + b$, where a and b are real numbers, then a and b are equal to

A) $-\frac{1}{2},\ 3$

B) $-\frac{1}{2},\ 7$

C) $-2,\ 3$

D) $\frac{1}{2},\ -3$

E) $-1,\ 10$

Q
22

If $(g \circ f)(x) = -2x^2 + 4|x| + 3$ and $g(x) = -2x + 3$, then $f(-1) =$

A) -1

B) 2

C) 1

D) -2

E) 0

Q
23

Let $f(x) = x^2 - 2x$ and $g(x) = \frac{1}{x+3}$. If $(f \circ g)(k) = 0$, then k is equal to

A) $-\frac{2}{5}$

B) 2

C) $-\frac{1}{2}$

D) -2

E) $-\frac{5}{2}$

Q
24

Given that $(g \circ f)(k) = 1$, where $f(x) = x + 1$ and $g(x) = 2 - x^2$, the set of all possible values of k is equal to

A) $\{-2, 0\}$

B) $\{-2, -1, 0, 1, 2\}$

C) $\{0\}$

D) $\{-2, 0, 2\}$

E) $\{0, 2\}$

Answer Key

"Original" shows the question number in the source worksheet.

Q	Original	Ans.	Value
1	1	**A**	$[0, 3)$
2	4	**A**	$[-4, 3) \cup (3, 4)$
3	18	**A**	$[-1, 0) \cup (0, \infty)$
4	23	**A**	-1
5	20	**D**	$(-\infty, -2) \cup (-2, -1) \cup (-1, 2) \cup (2, \infty)$
6	10	**A**	$[-2, 7) \cup (7, \infty)$
7	14	**A**	$\left(0, \frac{2}{3}\right]$
8	12	**B**	$4 + 2\sqrt{2}$
9	3	**A**	$(f - g)(-1) = 0$
10	8	**C**	$3\sqrt{2}$
11	7	**A**	-3
12	16	**C**	2
13	17	**A**	0
14	21	**D**	1
15	22	**A**	3
16	24	**A**	7
17	2	**A**	1
18	5	**A**	± 3
19	6	**A**	3
20	9	**E**	$x + 1$
21	13	**A**	$-\frac{1}{2},\ 3$
22	19	**A**	-1
23	11	**E**	$-\frac{5}{2}$
24	15	**A**	$\{-2, 0\}$