CHAPTER 2.1

Functions, Domain and Range

Multiple-Choice Old Exam Questions

25 questions • 4 topics • options A–E • two questions per page

Topic 1 | Difference Quotients

Simplifying difference quotients of polynomial, rational and radical functions • Questions 1–8

Q **1**

If $h \neq 0$ and $f(x) = x^2 - 1$, then $\frac{f(x+h)-f(x)}{h} =$

A) $2x + h$

B) $2x + h + 1$

C) $2x - h - 1$

D) $2x - h$

E) $h - 2$

Q **2**

Let $h \neq 0$. If $f(x) = x^2 + 5$, then $\frac{f(x)-f(x-h)}{h} =$

A) $2x - h$

B) $2x + h$

C) $2x$

D) $-2x + h$

E) $2x^2 - h$

Q
3

If $f(x) = x^2 - 2x + 3$ and $h \neq 0$, then $\frac{f(x+h)-f(x)}{h} =$

A) $2x - h + 2$

B) $2x + h + 2$

C) $x + h - 2$

D) $2x - h - 2$

E) $2x + h - 2$

Q
4

If $g(x) = 5x^2 - 4x$, then the expression $\frac{g(x+h)-g(x)}{h}$ simplifies to

A) $10x + 5h - 4$

B) $10x + 5h + 4$

C) $10x - 5h + 4$

D) $5x + 5h + 4$

E) $5x - 5h - 4$

Q
5

If $f(x) = x^3 - 1$ and $h \neq 0$, then $\frac{f(2+h)-f(2)}{h} =$

A) $h^2 + 6h + 12$

B) $h^2 + 6h + 14$

C) h^2

D) $h^2 - \frac{2}{h}$

E) $h^2 + 6h$

Q
6

If $f(x) = \frac{1}{x+1}$, then $\frac{f(1+h)-f(1)}{h}$ is equal to

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

B) $-\frac{3}{2(2+h)}$

C) $-\frac{1}{2(2+h)}$

D) $-\frac{2}{2+h}$

E) $-2(2+h)$

Q
7

If $f(x) = \frac{1}{x+1}$, then the difference quotient $\frac{f(1)-f(h+1)}{h} =$

A) $\frac{1}{2(h+2)}$

B) $\frac{-1}{2(h+2)}$

C) $\frac{h}{h+2}$

D) $\frac{-1}{h+2}$

E) $\frac{h}{2h+2}$

Q
8

If $f(x) = \sqrt{x}$, then $\frac{f(1+h)-f(1)}{h}$ is equal to

A) $-\frac{1}{1+\sqrt{1+h}}$

B) $\frac{1}{h}$

C) $\frac{1}{\sqrt{1+h}-1}$

D) $\frac{1}{1+\sqrt{1+h}}$

E) $-\frac{1}{h}$

Topic 2 | Domain of a Function

Finding the domain, in interval notation, of radical and rational functions • Questions 9–16

Q **9**

The domain of $y = \frac{1}{\sqrt{x}-3}$ in interval notation is:

A) $[0, 9) \cup (9, \infty)$

B) $(-\infty, 9) \cup (9, \infty)$

C) $[0, \infty)$

D) $(3, \infty)$

E) $(9, \infty)$

Q **10**

The domain of the function $y = \frac{3}{\sqrt{x}-2}$ is

A) $[0, 4) \cup (4, \infty)$

B) $(-\infty, 4) \cup (4, \infty)$

C) $[0, \infty)$

D) $(4, \infty)$

E) $[0, 2) \cup (2, \infty)$

Q
11

If D is the domain of $y = \frac{1}{\sqrt{x-3}}$ and R is the range of $y = x^2$, then:

A) $D = (3, \infty)$ and $R = [0, \infty)$

B) $D = [3, \infty)$ and $R = [0, \infty)$

C) $D = (3, \infty)$ and $R = (-\infty, \infty)$

D) $D = [3, \infty)$ and $R = (0, \infty)$

E) $D = (-\infty, 3)$ and $R = [0, \infty)$

Q
12

The domain, in interval notation, of the function $f(x) = \frac{\sqrt{x-2}}{x^2-3x}$ is equal to

A) $[2, 3) \cup (3, \infty)$

B) $[2, \infty)$

C) $(2, 3) \cup (3, \infty)$

D) $(-\infty, 0) \cup (0, 3) \cup (3, \infty)$

E) $[3, \infty)$

Q
13

The domain of the function $f(x) = \frac{x-3}{x^3-x^2-9x+9}$ is

A) $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$

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

C) $(-\infty, -3) \cup (-3, 1) \cup (1, 3) \cup (3, \infty)$

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

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

Q
14

The domain of the function $y = \sqrt{\frac{x^2-3x}{2-x}}$ is

A) $(-\infty, 0] \cup (2, 3]$

B) $(-\infty, 0] \cup [2, 3]$

C) $[0, 2) \cup [3, \infty)$

D) $(-\infty, 0) \cup (2, 3)$

E) $[0, 2) \cup (2, 3]$

Q
15

The domain of $g(x) = \sqrt{x - x^3}$ is

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

B) $[-1, 0] \cup [1, \infty)$

C) $[-1, 1]$

D) $(-\infty, -1] \cup [1, \infty)$

E) $[0, 1]$

Q
16

If the domain, in interval notation, of $f(x) = \sqrt{|x - 2| - 1}$ is given by $(-\infty, a] \cup [b, \infty)$, then $a + b =$

A) 4

B) 1

C) 5

D) 3

E) -1

Topic 3 | Domain and Range

Finding the domain D and the range R of functions involving square roots • Questions 17–20

Q **17**

The domain D and the range R of the function $f(x) = 2 - \sqrt{6 - 3x}$ are respectively given by

A) $D = (-\infty, 2]$ and $R = (-\infty, 2]$

B) $D = (-\infty, 2]$ and $R = [2, \infty)$

C) $D = (-\infty, 2]$ and $R = [2, 6]$

D) $D = [2, \infty)$ and $R = [2, \infty)$

E) $D = [2, \infty)$ and $R = (-\infty, 2]$

Q **18**

The domain D and the range R of the function $f(x) = \frac{\sqrt{4-9x^2}}{2}$ are given by

A) $D = \left[-\frac{2}{3}, \frac{2}{3}\right]; R = [0, 1]$

B) $D = \left[-\frac{2}{3}, \frac{2}{3}\right]; R = (-\infty, 0]$

C) $D = \left[-\frac{2}{3}, \frac{2}{3}\right]; R = [0, \infty)$

D) $D = \left(-\infty, -\frac{2}{3}\right]; R = [0, \infty)$

E) $D = \left[\frac{2}{3}, \infty\right); R = [0, 1)$

Q
19

If $f(x) = \sqrt{7 - 3x}$, then the domain D and the range R are:

A) $D = \left(-\infty, \frac{7}{3}\right]$ and $R = [0, \infty)$

B) $D = \left[\frac{7}{3}, \infty\right)$ and $R = [0, \infty)$

C) $D = \left(-\infty, \frac{7}{3}\right]$ and $R = (-\infty, 0]$

D) $D = \left(-\infty, \frac{7}{3}\right)$ and $R = (0, \infty)$

E) $D = \left(-\infty, \frac{7}{3}\right]$ and $R = \left[\frac{7}{3}, \infty\right)$

Q
20

If D is the domain of $y = \frac{5}{x-9}$ and R is the range of $y = \sqrt{x - 1}$, then:

A) $D = (-\infty, 9) \cup (9, \infty)$ and $R = [0, \infty)$

B) $D = (-\infty, 9) \cup (9, \infty)$ and $R = [1, \infty)$

C) $D = (-\infty, 9]$ and $R = [0, \infty)$

D) $D = [9, \infty)$ and $R = [0, \infty)$

E) $D = (9, \infty)$ and $R = [1, \infty)$

Topic 4 | Evaluating Functions and Basic Concepts

Function notation, intersection of lines, piecewise functions and relations • Questions 21–25

Q **21**

If $f(x) = \frac{2}{3}x + 2$, then $f(x - 3) =$

A) $f(x) - 2$

B) $f(x) + 2$

C) $f(x) - 3$

D) $f(x) + 3$

E) $f(x) + \frac{2}{3}$

Q **22**

If $(a,\ b)$ is the intersection point of the graphs of $f_1(x) = -3x - 7$ and $f_2(x) = 2x + 13$, then $a + b =$

A) 1

B) -2

C) 4

D) -3

E) 3

Q
23

Which one of the following statements is FALSE?

A) The domain of the function $f(x) = -5$ is $\{-5\}$

B) The range of the relation $x = -7$ is $(-\infty, \infty)$

C) The domain and range of the function $6x - 7y = 0$ are both $(-\infty, \infty)$

D) The slope of a vertical line is undefined

E) The graph of a constant function is a horizontal line

Q
24

If $f(x) = \begin{cases} 4x^2 & \text{if } x \leq 0 \\ 2x + 1 & \text{if } 0 < x < 2 \\ |x - 2| & \text{if } x \geq 2 \end{cases}$, then $f(-1) + f(1) + f(5) =$

A) 10

B) 4

C) 7

D) 13

E) 16

Q
25

The relation $y^2 - 1 = x$ is a function if

A) $y < 0$

B) $x < 0$

C) $x > 0$

D) $x > -1$

E) $y > -1$

Answer Key

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

Q	Original	Ans.	Value
1	1	**A**	$2x + h$
2	19	**A**	$2x - h$
3	21	**E**	$2x + h - 2$
4	8	**A**	$10x + 5h - 4$
5	3	**A**	$h^2 + 6h + 12$
6	17	**C**	$-\frac{1}{2(2+h)}$
7	23	**A**	$\frac{1}{2(h+2)}$
8	18	**D**	$\frac{1}{1+\sqrt{1+h}}$
9	4	**A**	$[0, 9) \cup (9, \infty)$
10	15	**A**	$[0, 4) \cup (4, \infty)$
11	13	**A**	$D = (3, \infty)$ and $R = [0, \infty)$
12	9	**A**	$[2, 3) \cup (3, \infty)$
13	22	**C**	$(-\infty, -3) \cup (-3, 1) \cup (1, 3) \cup (3, \infty)$
14	14	**A**	$(-\infty, 0] \cup (2, 3]$
15	16	**A**	$(-\infty, -1] \cup [0, 1]$
16	20	**A**	4
17	2	**A**	$D = (-\infty, 2]$ and $R = (-\infty, 2]$
18	5	**A**	$D = \left[-\frac{2}{3}, \frac{2}{3}\right]; R = [0, 1]$
19	11	**A**	$D = \left(-\infty, \frac{7}{3}\right]$ and $R = [0, \infty)$
20	12	**A**	$D = (-\infty, 9) \cup (9, \infty)$ and $R = [0, \infty)$
21	6	**A**	$f(x) - 2$
22	7	**A**	1
23	10	**A**	The domain of the function $f(x) = -5$ is $\{-5\}$
24	24	**A**	10
25	25	**A**	$y < 0$