

Functions

MCQ Test, Set 07

Time: 30 minutes

Maximum marks: 25

Name: _____ Class: _____ Date: _____

- There are 25 questions. Each has exactly one correct answer: choose A, B, C or D.
- Each correct answer carries 1 mark. There is no negative marking.
- The key sheet and worked solutions are at the end of this test.

- If $f(x) = 2x + 9$, then the image of -6 under f is
A. $-\frac{15}{2}$ **B.** -3 **C.** 21 **D.** -21
- If $A = \{-2, 0, 1\}$, $B = \{-8, 0, 1, 8\}$ and $f : A \rightarrow B$ is defined by $f(x) = x^3$, then the range of f is
A. $\{-2, 0, 1\}$ **B.** $\{0, 1, 8\}$ **C.** $\{-8, 0, 1\}$ **D.** $\{-8, 0, 1, 8\}$
- If $f(x) = 4x^2 + x - 7$, then $f(2) =$
A. 13 **B.** 11 **C.** 25 **D.** 7
- The graph of $y = -2$ passes through
A. $(5, -2)$ **B.** $(0, 2)$ **C.** $(-2, 5)$ **D.** $(-2, 0)$
- The line $y = 3 - 6x$ cuts the x-axis at
A. $(0, 3)$ **B.** $(\frac{1}{2}, 0)$ **C.** $(-\frac{1}{2}, 0)$ **D.** $(-3, 0)$
- The discriminant of $x^2 - 8x + 5 = 0$ is
A. -84 **B.** 44 **C.** 84 **D.** -28
- If α, β are the roots of $5x^2 + 3x - 1 = 0$, then $\alpha + \beta =$
A. $-\frac{3}{5}$ **B.** $\frac{3}{5}$ **C.** $-\frac{1}{5}$ **D.** $\frac{1}{5}$
- The vertex of $y = -2(x + 1)^2 + 4$ is
A. $(1, 4)$ **B.** $(1, -4)$ **C.** $(-1, 4)$ **D.** $(-1, -4)$
- The graph of $y = 2x^2 - 5x + 7$ cuts the y-axis at
A. $(0, 7)$ **B.** $(0, -7)$ **C.** $(0, 8)$ **D.** $(7, 0)$
- If $(x - 4)^2 > 0$, then $x \in$
A. $\mathbb{R}$ **B.** $\{4\}$ **C.** ϕ **D.** $\mathbb{R} - \{4\}$
- If $x^2 + 2x + 6 > 0$, then $x \in$
A. $\mathbb{R}$ **B.** $\{-1\}$ **C.** ϕ **D.** $\mathbb{R} - \{-1\}$

12. In $\log_a N$, the base a must belong to
A. $(0, 1) \cup (1, \infty)$ **B.** $\mathbb{R} - \{1\}$ **C.** $[0, 1) \cup (1, \infty)$ **D.** $(0, \infty)$
-
13. $\log_{27} 9 =$
A. $\frac{3}{2}$ **B.** 3 **C.** $\frac{1}{3}$ **D.** $\frac{2}{3}$
-
14. The point on the graph of $y = \log_2 x$ with $x = \frac{1}{8}$ is
A. $(\frac{1}{8}, -\frac{1}{3})$ **B.** $(\frac{1}{8}, 3)$
C. $(\frac{1}{8}, -3)$ **D.** $(-3, \frac{1}{8})$
-
15. If $\log_2(x + 2) = \log_{1/2} x$, then $x =$
A. $-1 + \sqrt{2}$ or $-1 - \sqrt{2}$ **B.** $-1 + \sqrt{2}$
C. $-1 - \sqrt{2}$ **D.** 1
-
16. $|x + y| = |x| + |y|$ holds when
A. $x + y < 0$ **B.** $xy < 0$ **C.** $x > y$ **D.** $xy \geq 0$
-
17. If $|2x + 5| \leq 7$, then $x \in$
A. $(-6, 1)$ **B.** $(-\infty, -6) \cup (1, \infty)$
C. $[-6, 1]$ **D.** $(-\infty, -6] \cup [1, \infty)$
-
18. If $|x + 1| = 6$, then $x \in$
A. $\{-6, 6\}$ **B.** $\{5\}$ **C.** $\{-5, 7\}$ **D.** $\{-7, 5\}$
-
19. The solution set of $|x| + |x - 4| = 6$ is
A. $\{-1\}$ **B.** $\{-1, 5\}$ **C.** $\{-5, 1\}$ **D.** $\{5\}$
-
20. If $x^2 - |x| - 2 \leq 0$, then $x \in$
A. $[-2, 1]$ **B.** $[-1, 2]$ **C.** $(-2, 2)$ **D.** $[-2, 2]$
-
21. The domain of $f(x) = \sqrt{-x^2 + 2x + 8}$ is
A. $(-\infty, -2] \cup [4, \infty)$ **B.** $(-2, 4)$
C. $[-2, 4]$ **D.** $[-4, 2]$
-
22. If $-3 \leq x < -2$, then $[x] =$
A. 2 **B.** -2 **C.** 3 **D.** -3
-
23. $[[-2.3]] =$
A. 2 **B.** -2.3 **C.** -3 **D.** -2
-
24. $\{-0.6\} + \{0.6\} =$
A. 1 **B.** -0.2 **C.** 0 **D.** 1.2
-
25. The domain of $f(x) = \frac{1}{x}$ is
A. $(0, \infty)$ **B.** $\mathbb{R}$ **C.** $\mathbb{R} - \{0\}$ **D.** $[0, \infty)$
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Key sheet

1. B	2. C	3. B	4. A	5. B
6. B	7. A	8. C	9. A	10. D
11. A	12. A	13. D	14. C	15. B
16. D	17. C	18. D	19. B	20. D
21. C	22. D	23. C	24. A	25. C

Solutions

1. If $f(x) = 2x + 9$, then the image of -6 under f is

$$f(-6) = 2(-6) + 9 = -3$$

Ans: (B) -3

2. If $A = \{-2, 0, 1\}$, $B = \{-8, 0, 1, 8\}$ and $f : A \rightarrow B$ is defined by $f(x) = x^3$, then the range of f is

$$f(-2) = (-2)^3 = -8, f(0) = (0)^3 = 0, f(1) = (1)^3 = 1$$

Range = $f(A) = \{-8, 0, 1\}$ (not the codomain B)

Ans: (C) $\{-8, 0, 1\}$

3. If $f(x) = 4x^2 + x - 7$, then $f(2) =$

$$f(2) = 4(2)^2 + (2) - 7 = 11$$

Ans: (B) 11

4. The graph of $y = -2$ passes through

On $y = -2$ every point has y -coordinate -2 : $(5, -2)$

Ans: (A) $(5, -2)$

5. The line $y = 3 - 6x$ cuts the x -axis at

$$\text{put } y = 0: 3 - 6x = 0 \Rightarrow x = \frac{1}{2}$$

Ans: (B) $(\frac{1}{2}, 0)$

6. The discriminant of $x^2 - 8x + 5 = 0$ is

$$\Delta = b^2 - 4ac = (-8)^2 - 4(1)(5) = 44$$

Ans: (B) 44

7. If α, β are the roots of $5x^2 + 3x - 1 = 0$, then $\alpha + \beta =$

$$a = 5, b = 3$$

$$\alpha + \beta = -\frac{b}{a} = -\frac{3}{5}$$

Ans: (A) $-\frac{3}{5}$

8. The vertex of $y = -2(x + 1)^2 + 4$ is

$$y = a(x - h)^2 + k \text{ has vertex } (h, k)$$

Vertex = $(-1, 4)$

Ans: (C) $(-1, 4)$

9. The graph of $y = 2x^2 - 5x + 7$ cuts the y -axis at

$$\text{put } x = 0: y = 7$$

Ans: (A) $(0, 7)$

10. If $(x - 4)^2 > 0$, then $x \in$

$$y = (x - 4)^2 = x^2 - 8x + 16$$

$a = 1 > 0$ (upward parabola)

$$\Delta = b^2 - 4ac = (-8)^2 - 4(1)(16) = 0$$

$$\Delta = 0 \Rightarrow y = (x - 4)^2$$

$y > 0$ for all $x \neq 4$, and $y = 0$ at $x = 4$

$$\therefore x \in \mathbb{R} - \{4\}$$

Ans: (D) $\mathbb{R} - \{4\}$

11. If $x^2 + 2x + 6 > 0$, then $x \in$

$a = 1 > 0$ (upward parabola)

$$\Delta = b^2 - 4ac = 2^2 - 4(1)(6) = -20$$

$a > 0, \Delta < 0$: $y > 0$ for all $x \in \mathbb{R}$

$$\therefore x \in \mathbb{R}$$

Ans: (A) $\mathbb{R}$

12. In $\log_a N$, the base a must belong to

$a = 0, a = 1$ and $a < 0$ give contradictions (e.g. $1^2 = 1^3 = 1$)

So $a > 0, a \neq 1$: $a \in (0, 1) \cup (1, \infty)$

Ans: (A) $(0, 1) \cup (1, \infty)$

13. $\log_{27} 9 =$

$$\log_{3^3} 3^2 = \frac{2}{3} \log_3 3 = \frac{2}{3}$$

Ans: (D) $\frac{2}{3}$

14. The point on the graph of $y = \log_2 x$ with $x = \frac{1}{8}$ is

$$\log_2 \frac{1}{8} = \log_2 2^{-3} = -3$$

Ans: (C) $(\frac{1}{8}, -3)$

15. If $\log_2(x + 2) = \log_{1/2} x$, then $x =$

$$\log_2(x + 2) = \log_2 \frac{1}{x} \Rightarrow x^2 + 2x - 1 = 0$$

$$x = -1 \pm \sqrt{2}$$

x must be positive, so $x = -1 + \sqrt{2}$

Ans: (B) $-1 + \sqrt{2}$

16. $|x + y| = |x| + |y|$ holds when

Property: $|x + y| = |x| + |y|$ for $xy \geq 0$

and $|x + y| < |x| + |y|$ for $xy < 0$

Ans: (D) $xy \geq 0$

17. If $|2x + 5| \leq 7$, then $x \in$

$$-7 \leq 2x + 5 \leq 7$$

$$\Rightarrow -7 - 5 \leq 2x \leq 7 - 5$$

$$\Rightarrow -6 \leq x \leq 1$$

$$\Rightarrow x \in [-6, 1]$$

Ans: (C) $[-6, 1]$

18. If $|x + 1| = 6$, then $x \in$

$$x + 1 = \pm 6$$

$$x + 1 = 6 \Rightarrow x - 5 = 0 \Rightarrow x = 5$$

$$x + 1 = -6 \Rightarrow x + 7 = 0 \Rightarrow x = -7$$

Ans: (D) $\{-7, 5\}$

19. The solution set of $|x| + |x - 4| = 6$ is

Case (i) Suppose $x < 0$ ($x < 0, x - 4 < 0$): $(-x) + (4 - x) = 6 \Rightarrow 4 - 2x = 6 \Rightarrow x = -1$, which is in this case

Case (ii) Suppose $0 \leq x \leq 4$ ($x \geq 0, x - 4 \leq 0$): $(x) + (4 - x) = 6 \Rightarrow 4 = 6$: not possible, no solution

Case (iii) Suppose $x > 4$ ($x > 0, x - 4 > 0$): $(x) + (x - 4) = 6 \Rightarrow 2x - 4 = 6 \Rightarrow x = 5$, which is in this case

$$\text{So } x \in \{-1, 5\}$$

Ans: (B) $\{-1, 5\}$

20. If $x^2 - |x| - 2 \leq 0$, then $x \in$

$x = 0$ is the critical point

Case (i) Suppose $x < 0$: $|x| = -x, x^2 + x - 2 \leq 0 \Rightarrow (x - 1)(x + 2) \leq 0 \Rightarrow x \in [-2, 1]$; common values $[-2, 0)$

Case (ii) Suppose $x \geq 0$: $|x| = x, x^2 - x - 2 \leq 0 \Rightarrow (x - 2)(x + 1) \leq 0 \Rightarrow x \in [-1, 2]$; common values $[0, 2]$

From (i), (ii): $x \in [-2, 2]$

Ans: (D) $[-2, 2]$

21. The domain of $f(x) = \sqrt{-x^2 + 2x + 8}$ is

$\sqrt{-x^2 + 2x + 8}$ is defined when $-x^2 + 2x + 8 \geq 0$

$$\Rightarrow x^2 - 2x - 8 \leq 0$$

$$\Rightarrow (x - 4)(x + 2) \leq 0$$

$$\text{Domain} = [-2, 4]$$

Ans: (C) $[-2, 4]$

22. If $-3 \leq x < -2$, then $[x] =$

$$n \leq x < n + 1 \Rightarrow [x] = n; \text{ here } n = -3$$

Ans: (D) -3

23. $\lceil \lceil -2.3 \rceil \rceil =$

$$\lceil -2.3 \rceil = -3$$

$$\lceil \lceil -2.3 \rceil \rceil = \lceil -3 \rceil = -3$$

Ans: (C) -3

24. $\{-0.6\} + \{0.6\} =$

$$\{-0.6\} = 0.4, \{0.6\} = 0.6$$

$$0.4 + 0.6 = 1$$

Ans: (A) 1

25. The domain of $f(x) = \frac{1}{x}$ is

$\frac{1}{x}$ is not defined only at $x = 0$

Ans: (C) $\mathbb{R} - \{0\}$
