

Functions

MCQ Test, Set 08

Time: 30 minutes

Maximum marks: 25

Name: _____ Class: _____ Date: _____

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

1. The pre-image of 27 under $f(x) = 5x + 2$ is
A. 137 **B.** 5 **C.** $\frac{29}{5}$ **D.** -5
2. If $A = \{1, 3, 5\}$, $B = \{1, 3, 5, 7, 9\}$ and $f : A \rightarrow B$ is defined by $f(x) = 2x - 1$, then the range of f is
A. $\{1, 5, 9\}$ **B.** $\{1, 3, 5, 7, 9\}$ **C.** $\{3, 7, 11\}$ **D.** $\{1, 3, 5\}$
3. The domain of the polynomial function $f(x) = 5x^2 - 2x + 9$ is
A. $(0, \infty)$ **B.** $\mathbb{R} - \{0\}$
C. $\mathbb{R} = (-\infty, \infty)$ **D.** $[0, \infty)$
4. If I_A is the identity function on $A = \{1, 3, 5, 7\}$, then the range of I_A is
A. $\{1\}$ **B.** $\{1, 3, 5, 7\}$ **C.** $\{7\}$ **D.** $\{2, 6, 10, 14\}$
5. The line $y = 12 - 8x$ cuts the y-axis at
A. $(12, 0)$ **B.** $(\frac{3}{2}, 0)$ **C.** $(0, -12)$ **D.** $(0, 12)$
6. The roots of $x^2 + 3x - 28 = 0$ are
A. $\{4, 7\}$ **B.** $\{-7, -4\}$ **C.** $\{-7, 4\}$ **D.** $\{-4, 7\}$
7. If α, β are the roots of $2x^2 + 7x - 4 = 0$, then $\alpha\beta =$
A. 2 **B.** -2 **C.** $-\frac{7}{2}$ **D.** $-\frac{1}{2}$
8. The minimum value of $x^2 + 10x + 28$ is
A. -5 **B.** 53 **C.** 3 **D.** 28
9. The graph of $y = 25x^2 + 20x + 4$ touches the x-axis at
A. $(-\frac{4}{5}, 0)$ **B.** $(-\frac{2}{5}, 0)$ **C.** $(\frac{2}{5}, 0)$ **D.** $(0, 4)$
10. If $-x^2 - x - 1 \geq 0$, then $x \in$
A. $\mathbb{R} - \{-\frac{1}{2}\}$ **B.** $\mathbb{R}$
C. ϕ **D.** $\{-\frac{1}{2}\}$

11. If $x^2 + 10x + 25 \leq 0$, then $x \in$
A. $\{-5\}$ **B.** $\mathbb{R}$ **C.** ϕ **D.** $\mathbb{R} - \{-5\}$
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12. $\log_{1/6} 216 =$
A. $-\frac{1}{3}$ **B.** -3 **C.** 3 **D.** 36
-
13. $\frac{\log 64}{\log 4} =$
A. 3 **B.** 2 **C.** 16 **D.** $\frac{1}{3}$
-
14. Which of the following is positive?
A. $\log_{1/6} 40$ **B.** $\log_{1/2} 5$ **C.** $\log_{0.3} 0.6$ **D.** $\log_4 0.9$
-
15. $\frac{\log(2\sqrt{2}) + \log(5\sqrt{5})}{\log 10} =$
A. $\frac{1}{2}$ **B.** 10 **C.** 3 **D.** $\frac{3}{2}$
-
16. $|(-3)(-4)| + |-3 + 4| =$
A. 11 **B.** -13 **C.** 19 **D.** 13
-
17. If $|x + 6| \geq 2$, then $x \in$
A. $[-8, -4]$ **B.** $(-\infty, -8] \cup [-4, \infty)$
C. $(-\infty, -8) \cup (-4, \infty)$ **D.** $(-8, -4)$
-
18. $|5x - 1| = 5x - 1$ for $x \in$
A. $(-\infty, \frac{1}{5})$ **B.** $(\frac{1}{5}, \infty)$ **C.** $\mathbb{R}$ **D.** $[\frac{1}{5}, \infty)$
-
19. For $x > 2$, $|x + 3| + |x - 2| =$
A. $2x + 1$ **B.** $2x - 1$ **C.** 5 **D.** $-2x - 1$
-
20. If $|x^2 - 9| + |x - 3| = 0$, then $x \in$
A. ϕ **B.** $\{-3\}$ **C.** $\{-3, 3\}$ **D.** $\{3\}$
-
21. The domain of $f(x) = \sqrt{x^2 + 4}$ is
A. $[2, \infty)$ **B.** $\mathbb{R} - \{-2, 2\}$ **C.** $[-2, 2]$ **D.** $\mathbb{R}$
-
22. $[-4] + [4.9] =$
A. 0 **B.** 0.9 **C.** 1 **D.** -1
-
23. If $x = 3.2$, then $[-x] =$
A. 3 **B.** -3 **C.** -4 **D.** 4
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24. The integral part and the fractional part of -2.7 are
A. -3 and 0.3 **B.** -3 and -0.3 **C.** -2 and -0.7 **D.** -2 and 0.7
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25. For $x \in \mathbb{R}$, the set of all values of x^2 is
A. $[0, \infty)$ **B.** $[1, \infty)$ **C.** $(0, \infty)$ **D.** $\mathbb{R}$
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Key sheet

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

Solutions

1. The pre-image of 27 under $f(x) = 5x + 2$ is

$$f(x) = 27 \Rightarrow 5x + 2 = 27 \Rightarrow x = 5$$

Ans: (B) 5

2. If $A = \{1, 3, 5\}$, $B = \{1, 3, 5, 7, 9\}$ and $f : A \rightarrow B$ is defined by $f(x) = 2x - 1$, then the range of f is

$$f(1) = 2(1) - 1 = 1, f(3) = 2(3) - 1 = 5, f(5) = 2(5) - 1 = 9$$

$$\text{Range} = f(A) = \{1, 5, 9\} \text{ (not the codomain } B)$$

Ans: (A) $\{1, 5, 9\}$

3. The domain of the polynomial function $f(x) = 5x^2 - 2x + 9$ is

$f(x)$ is defined for every real x

Domain of a polynomial function is $\mathbb{R}$

Ans: (C) $\mathbb{R} = (-\infty, \infty)$

4. If I_A is the identity function on $A = \{1, 3, 5, 7\}$, then the range of I_A is

Each element is its own image

$$\text{Range} = A = \{1, 3, 5, 7\}$$

Ans: (B) $\{1, 3, 5, 7\}$

5. The line $y = 12 - 8x$ cuts the y-axis at

$$\text{put } x = 0: y = 12$$

Ans: (D) (0, 12)

6. The roots of $x^2 + 3x - 28 = 0$ are

$$\Delta = b^2 - 4ac = 3^2 - 4(1)(-28) = 121$$

$$x = \frac{-3 \pm 11}{2} = -7, 4$$

Ans: (C) $\{-7, 4\}$

7. If α, β are the roots of $2x^2 + 7x - 4 = 0$, then $\alpha\beta =$

$$a = 2, c = -4$$

$$\alpha\beta = \frac{c}{a} = -2$$

Ans: (B) -2

8. The minimum value of $x^2 + 10x + 28$ is

$$\text{Vertex} = \left(-\frac{b}{2a}, \frac{4ac-b^2}{4a}\right) = \left(-5, \frac{112-100}{4}\right) = (-5, 3)$$

$$a > 0: \text{minimum value} = 3$$

Ans: (C) 3

9. The graph of $y = 25x^2 + 20x + 4$ touches the x-axis at

$$\Delta = 0, \text{ perfect square: } y = (5x + 2)^2$$

$$y = 0 \Rightarrow x = -\frac{2}{5}$$

$$\text{Ans: (B) } (-\frac{2}{5}, 0)$$

10. If $-x^2 - x - 1 \geq 0$, then $x \in$

$$a = -1 < 0 \text{ (downward parabola)}$$

$$\Delta = b^2 - 4ac = (-1)^2 - 4(-1)(-1) = -3$$

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

$$\therefore x \in \phi$$

$$\text{Ans: (C) } \phi$$

11. If $x^2 + 10x + 25 \leq 0$, then $x \in$

$$a = 1 > 0 \text{ (upward parabola)}$$

$$\Delta = b^2 - 4ac = 10^2 - 4(1)(25) = 0$$

$$\Delta = 0 \Rightarrow y = (x + 5)^2$$

$$y > 0 \text{ for all } x \neq -5, \text{ and } y = 0 \text{ at } x = -5$$

$$\therefore x \in \{-5\}$$

$$\text{Ans: (A) } \{-5\}$$

12. $\log_{1/6} 216 =$

$$\left(\frac{1}{6}\right)^{-3} = 6^3 = 216$$

So the value is -3

$$\text{Ans: (B) } -3$$

13. $\frac{\log 64}{\log 4} =$

$$\frac{\log a}{\log b} = \log_b a$$

$$\log_4 64 = \log_4 4^3 = 3$$

(It is not $\log \frac{64}{4}$)

$$\text{Ans: (A) } 3$$

14. Which of the following is positive?

$$\log_a x > 0 \text{ when } a > 1, x > 1 \text{ or } 0 < a < 1, 0 < x < 1$$

$$\log_{0.3} 0.6: \text{ both between 0 and 1: positive}$$

$$\text{Ans: (C) } \log_{0.3} 0.6$$

15. $\frac{\log(2\sqrt{2}) + \log(5\sqrt{5})}{\log 10} =$

$$2\sqrt{2} \cdot 5\sqrt{5} = 2^{3/2} 5^{3/2} = 10^{3/2}$$

$$\frac{\log 10^{3/2}}{\log 10} = \log_{10} 10^{3/2} = \frac{3}{2}$$

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

16. $|(-3)(-4)| + |-3 + 4| =$
 $|12| + |1| = 12 + 1 = 13$

Ans: (D) 13

17. If $|x + 6| \geq 2$, then $x \in$
 $x + 6 \leq -2$ (or) $x + 6 \geq 2$
 $\Rightarrow x \leq -8$ (or) $x \geq -4$
 $\Rightarrow x \in (-\infty, -8] \cup [-4, \infty)$
Ans: (B) $(-\infty, -8] \cup [-4, \infty)$

18. $|5x - 1| = 5x - 1$ for $x \in$
 $|T| = T \Rightarrow T \geq 0$
 $5x - 1 \geq 0 \Rightarrow x \geq \frac{1}{5}$
Ans: (D) $[\frac{1}{5}, \infty)$

19. For $x > 2$, $|x + 3| + |x - 2| =$
Here $x + 3 > 0$ and $x - 2 > 0$
 $|x + 3| + |x - 2| = (x + 3) + (x - 2) = 2x + 1$
Ans: (A) $2x + 1$

20. If $|x^2 - 9| + |x - 3| = 0$, then $x \in$
Both must be 0: $x^2 - 9 = 0$ and $x - 3 = 0$
 $x = \pm 3$ and $x = 3 \Rightarrow x = 3$
Ans: (D) $\{3\}$

21. The domain of $f(x) = \sqrt{x^2 + 4}$ is
 $\sqrt{x^2 + 4}$ is defined when $x^2 + 4 \geq 0$
 $a > 0, \Delta = -16 < 0$
Domain = $\mathbb{R}$
Ans: (D) $\mathbb{R}$

22. $[-4] + [4.9] =$
 $[-4] = -4, [4.9] = 4$
 $-4 + 4 = 0$
Ans: (A) 0

23. If $x = 3.2$, then $[-x] =$
 $x \notin \mathbb{Z}: [-x] = -[x] - 1 = -3 - 1 = -4$
Ans: (C) -4

24. The integral part and the fractional part of -2.7 are

$$-2.7 = -3 + 0.3$$

Integral part -3 , fractional part 0.3

Ans: (A) -3 and 0.3

25. For $x \in \mathbb{R}$, the set of all values of x^2 is

$$x^2 \geq 0 \text{ and takes the value } 0 \text{ at } x = 0$$

$$\text{Range} = [0, \infty)$$

Ans: (A) $[0, \infty)$
