

## Topic :- RELATIONS AND FUNCTIONS

1. If  $2f(x^2) + 3f\left(\frac{1}{x^2}\right) = x^2 - 1$  for all  $x \in R - \{0\}$ , then  $f(x^4)$  is
  - a)  $\frac{(1-x^4)(2x^4+3)}{5x^4}$
  - b)  $\frac{(1+x^4)(2x^4-3)}{5x^4}$
  - c)  $\frac{(1-x^4)(2x^4-3)}{5x^4}$
  - d) None of these
  
2. The domain of definition of the function  $f(x) = {}^{7-x}P_{x-3}$ , is
  - a) [3, 7]
  - b) {3, 4, 5, 6, 7}
  - c) {3, 4, 5}
  - d) None of these
  
3. Let  $f(x) = x$  and  $g(x) = |x|$  for all  $x \in R$ . Then, the function  $\phi(x)$  satisfying  $\{\phi(x) - f(x)\}^2 + \{\phi(x) - g(x)\}^2 = 0$ , is
  - a)  $\phi(x) = x, x \in [0, \infty)$
  - b)  $\phi(x) = x, x \in R$
  - c)  $\phi(x) = -x, x \in (-\infty, 0]$
  - d)  $\phi(x) = x + |x|, x \in R$
  
4. The value of the function  $f(x) = 3\sin\left(\sqrt{\frac{\pi^2}{16} - x^2}\right)$  lies in the interval
  - a)  $[-\pi/4, \pi/4]$
  - b)  $[0, 3/\sqrt{2}]$
  - c)  $(-3, 3)$
  - d) None of these
  
5. The period of the function  $f(x) = |\sin x| + |\cos x|$  is
  - a)  $\pi$
  - b)  $\pi/2$
  - c)  $2\pi$
  - d) None of these
  
6. If  $f(x) = (ax^2 + b)^3$ , then the function  $g$  such that  $f(g(x)) = g(f(x))$  is given by
  - a)  $g(x) = \left(\frac{b-x^{1/3}}{a}\right)^{1/2}$
  - b)  $g(x) = \frac{1}{(ax^2+b)^3}$
  - c)  $g(x) = (ax^2+b)^{1/3}$
  - d)  $g(x) = \left(\frac{x^{1/3}-b}{a}\right)^{1/2}$
  
7. Let  $R$  be the real line. Consider the following subsets of the plane  $R \times R$ 

$$S = \{(x, y): y = x + 1 \text{ and } 0 < x < 2\}$$

$$T = \{(x, y): x - y \text{ is an integer}\}$$
 Which of the following is true?
  - a)  $T$  is an equivalent relation on  $R$  but  $S$  is not
  - b) Neither  $S$  nor  $T$  is an equivalence relation on  $R$
  - c) Both  $S$  and  $T$  are equivalence relations on  $R$
  - d)  $S$  is an equivalence relations on  $R$  and  $T$  is not
  
8. Let  $A = [-1, 1]$  and  $f: A \rightarrow A$  be defined as  $f(x) = x|x|$  for all  $x \in A$ , then  $f(x)$  is
  - a) Many-one into function
  - b) One-one into function

c) Many-one onto function

d) One-one onto function

9. If  $f(x) = \frac{1-x}{1+x}, x \neq 0, -1$  and  $\alpha = f(f(x)) + f\left(f\left(\frac{1}{x}\right)\right)$ , then

a)  $\alpha > 2$

b)  $\alpha < -2$

c)  $|\alpha| > 2$

d)  $\alpha = 2$

10. Let  $R$  and  $S$  be two non-void relations on a set  $A$ . Which of the following statements is false?

a)  $R$  and  $S$  are transitive implies  $R \cap S$  is transitive.

b)  $R$  and  $S$  are transitive implies  $R \cup S$  is transitive.

c)  $R$  and  $S$  are symmetric implies  $R \cup S$  is symmetric.

d)  $R$  and  $S$  are reflexive implies  $R \cap S$  is reflexive.

11.  $A = \{1, 2, 3, 4\}, B = \{1, 2, 3, 4, 5, 6\}$  are two sets, and function  $f: A \rightarrow B$  is defined by  $f(x) = x + 2 \forall x \in A$ , then the function  $f$  is

a) Bijective

b) Onto

c) One-one

d) Many-one

12. Let  $f(x) = x + 1$  and  $\phi(x) = x - 2$ . Then the values of  $x$  satisfying  $|f(x) + \phi(x)| = |f(x)| + |\phi(x)|$  are :

a)  $(-\infty, 1]$

b)  $[2, \infty)$

c)  $(-\infty, -2]$

d)  $[1, \infty)$

13. The domain of the function  $f(x) = \frac{\sin^{-1}(3-x)}{\log_e(|x|-2)}$ , is

a)  $[2, 4]$

b)  $(2, 3) \cup (3, 4]$

c)  $[2, 3)$

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

14. If  $f(x) = \frac{1}{\sqrt{|x|-x}}$  then, domain of  $f(x)$  is

a)  $(-\infty, 0)$

b)  $(-\infty, 2)$

c)  $(-\infty, \infty)$

d) None of the above

15. The domain of definition of  $f(x) = \log_{10}\{(\log_{10} x)^2 - 5 \log_{10} x + 6\}$ , is

a)  $(0, 10^2)$

b)  $(10^3, \infty)$

c)  $(10^2, 10^3)$

d)  $(0, 10^2) \cup (10^3, \infty)$

16. If a function  $f(x)$  satisfies the condition

$f\left(x + \frac{1}{x}\right) = x^2 + \frac{1}{x^2}, x \neq 0$ , then  $f(x)$  equals

a)  $x^2 - 2$  for all  $x \neq 0$

b)  $x^2 - 2$  for all  $x$  satisfying  $|x| \geq 2$

c)  $x^2 - 2$  for all  $x$  satisfying  $|x| < 2$

d) None of these

17. The period of the function  $f(x) = \sin\left(\frac{2x+3}{6\pi}\right)$ , is

a)  $2\pi$

b)  $6\pi$

c)  $6\pi^2$

d) None of these

18.  $f: R \rightarrow R$  is a function defined by  $f(x) = 10x - 7$ . If  $g = f^{-1}$ , then  $g(x) =$

a)  $\frac{1}{10x-7}$

b)  $\frac{1}{10x+7}$

c)  $\frac{x+7}{10}$

d)  $\frac{x-7}{10}$

19. If  $f(x) = [x - 2]$ , where  $[x]$  denotes the greatest integer less than or equal to  $x$ , then  $f(2, 5)$  is equal to

a)  $\frac{1}{2}$

b) 0

c) 1

d) Does not exist

20. The domain of definition of

$$f(x) = \sqrt{\log_{10}(\log_{10} x) - \log_{10}(4 - \log_{10} x) - \log_{10} 3}, \text{ is}$$

a)  $(10^3, 10^4)$

b)  $[10^3, 10^4]$

c)  $[10^3, 10^4)$

d)  $(10^3, 10^4]$

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