

Topic :-RELATIONS AND FUNCTIONS

- The function $f(x) = \sin \frac{\pi x}{2} + 2 \cos \frac{\pi x}{3} - \tan \frac{\pi x}{4}$ is periodic with period
a) 6 b) 3 c) 4 d) 12
- The equivalent definition of the function
 $f(x) = \lim_{n \rightarrow \infty} \frac{x^n - x^{-n}}{x^n + x^{-n}}, x > 0$, is
a) $f(x) = \begin{cases} -1, & 0 < x \leq 1 \\ 1, & x > 1 \end{cases}$ b) $f(x) = \begin{cases} -1, & 0 < x < 1 \\ 1, & x \geq 1 \end{cases}$
c) $f(x) = \begin{cases} -1, & 0 < x < 1 \\ 0, & x = 1 \\ 1, & x > 1 \end{cases}$ d) None of these
- Let $R = \{(1, 3), (4, 2), (2, 4), (2, 3), (3, 1)\}$ be a relation on the set $A = \{1, 2, 3, 4\}$. The relation R is
a) A function b) Transitive c) Not symmetric d) Reflexive
- The domain of the function
 $f(x) = {}^{16-x}C_{2x-1} + {}^{20-3x}P_{4x-5}$, where the symbols have their usual meanings, is the set
a) $\{2, 3\}$ b) $\{2, 3, 4\}$ c) $\{1, 2, 3, 4\}$ d) $\{1, 2, 3, 4, 5\}$
- If $f:R \rightarrow C$ is defined by $f(x) = e^{2ix}$ for $x \in R$, then f is (where C denotes the set of all complex numbers)
a) One-one b) Onto
c) One-one and onto d) Neither one-one nor onto
- The domain of the function
 $f(x) = \log_{10}(\sqrt{x-4} + \sqrt{6-x})$ is
a) $[4, 6]$ b) $(-\infty, 6)$ c) $[2, 3]$ d) None of these
- If $f(x) = \sin^2 x, g(x) = \sqrt{x}$ and $h(x) = \cos^{-1} x, 0 \leq x \leq 1$, then
a) $hogof = fogoh$ b) $gofoh = fohog$ c) $fohog = hogof$ d) None of these
- If $f(x) = \frac{2^x + 2^{-x}}{2}$, then $f(x+y)f(x-y)$ is equal to

a) $\frac{1}{2}\{f(2x) + f(2y)\}$ b) $\frac{1}{2}\{f(2x) - f(2y)\}$ c) $\frac{1}{4}\{f(2x) + f(2y)\}$ d) $\frac{1}{4}\{f(2x) - f(2y)\}$

9. The relation R defined on the set of natural numbers as $\{(a, b): a \text{ differs from } b \text{ by } 3\}$ is given by
 a) $\{(1, 4), (2, 5), (3, 6), \dots\}$ b) $\{(4, 1), (5, 2), (6, 3), \dots\}$
 c) $\{(1, 3), (2, 6), (3, 9), \dots\}$ d) None of the above

10. The domain of the function $f(x) = \sin^{-1}(\log_3(x/3))$ is
 a) $[1, 9]$ b) $[-1, 9]$ c) $[-9, 1]$ d) $[-9, -1]$

11. The range of the function $f(x) = \sin\left\{\log_{10}\left(\frac{\sqrt{4-x^2}}{1-x}\right)\right\}$, is
 a) $[0, 1]$ b) $(-1, 0)$ c) $[-1, 1]$ d) $(-1, 1)$

12. Let $f(x) = \frac{ax+b}{cx+d}$. Then, $f \circ f(x) = x$ provided that
 a) $d = -a$ b) $d = a$ c) $a = b = c = d = 1$ d) $a = b = 1$

13. Let C denote the set of all complex numbers. The function $f : C \rightarrow C$ defined by $f(x) = \frac{ax+b}{cx+d}$ for $x \in C$, where $bd \neq 0$ reduces to a constant function if:
 a) $a = c$ b) $b = d$ c) $ad = bc$ d) $ab = cd$

14. If $\sin \lambda x + \cos \lambda x$ and $|\sin x| + |\cos x|$ are periodic function with the same period, then $\lambda =$
 a) 0 b) 1 c) 2 d) 4

15. The domain of definition of the real function $f(x) = \sqrt{\log_{12} x^2}$ of the real variable x , is
 a) $x > 0$ b) $|x| \geq 1$ c) $|x| \geq 4$ d) $x \geq 4$

16. If $f(x)$ is an even function and $f'(x)$ exists, then $f'(e) + f'(-e)$ is
 a) > 0 b) $= 0$ c) ≥ 0 d) < 0

17. If $f(x) = \log\left(\frac{1+x}{1-x}\right)$, then $f\left(\frac{2x}{1+x^2}\right)$ is equal to
 a) $\{f(x)\}^2$ b) $\{f(x)\}^3$ c) $2f(x)$ d) $3f(x)$

18. If the function $f: R \rightarrow R$ is defined by $f(x) = \cos^2 x + \sin^4 x$ then $f(R) =$
 a) $[3/4, 1)$ b) $(3/4, 1]$ c) $[3/4, 1]$ d) $(3/4, 1)$

19. The domain of $\sin^{-1}\left[\log_2\left(\frac{x}{12}\right)\right]$ is
 a) $[2, 12]$ b) $[-1, 1]$ c) $\left[\frac{1}{3}, 24\right]$ d) $[6, 24]$

20. The largest interval lying in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ for which the function $f(x) = 4^{-x^2} + \cos^{-1}\left(\frac{x}{2} - 1\right) + \log(\cos x)$ is defined, is

a) $[0, \pi]$ b) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ c) $\left[-\frac{\pi}{4}, \frac{\pi}{2}\right)$ d) $\left[0, \frac{\pi}{2}\right]$

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