

Tarun Classes of Mathematics

IIT-JEE Mains | CBSE | PU-CET | NDA

Talwara Township, Hoshiarpur | +91 9463672753 | tarunclasses.in

Relations and Functions

Subjects : Maths

Previous year Questions of JEE
Mains

Maths - Section A (MCQ.)

- Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined as $f(x) = \frac{2x^2 - 3x + 2}{3x^2 + x + 3}$. Then f is :
A) both one-one and onto
B) one-one but not onto
C) onto but not one-one
D) neither one-one nor onto
- The sum of all the elements in the range of $f(x) = \text{Sgn}(\sin x) + \text{Sgn}(\cos x) + \text{Sgn}(\tan x) + \text{Sgn}(\cot x)$, $x \neq \frac{n\pi}{2}$, $n \in \mathbb{Z}$, where $\text{Sgn}(t) = \begin{cases} 1, & \text{if } t > 0 \\ -1 & \text{if } t < 0 \end{cases}$, is
A) 4
B) 2
C) -2
D) 0
- If the domain of the function $f(x) = \log_{(10x^2 - 17x + 7)}(18x^2 - 11x + 1)$ is $(-\infty, a) \cup (b, c) \cup (d, \infty) - \{e\}$, then $90(a + b + c + d + e)$ equals:
A) 170
B) 177
C) 307
D) 316
- Let f be a function such that $3f(x) + 2f\left(\frac{m}{19x}\right) = 5x$, $x \neq 0$, where $m = \sum_{i=1}^9 (i)^2$. Then $f(5) - f(2)$ is equal to
A) -9
B) 36
C) 18
D) 9
- If the domain of the function $f(x) = \sin^{-1}\left(\frac{5-x}{3+2x}\right) + \frac{1}{\log_e(10-x)}$ is $(-\infty, \alpha] \cup [\beta, \gamma) - \{\delta\}$, then $6(\alpha + \beta + \gamma + \delta)$ is equal to
A) 70
B) 66
C) 67
D) 68
- Let the domains of the functions $f(x) = \log_4 \log_3 \log_7 (8 - \log_2 (x^2 + 4x + 5))$ and $g(x) = \sin^{-1}\left(\frac{7x+10}{x-2}\right)$ be (α, β) and $[\gamma, \delta]$, respectively. Then $\alpha^2 + \beta^2 + \gamma^2 + \delta^2$ is equal to :-
A) 15
B) 13
C) 16
D) 14
- If the domain of the function $f(x) = \log_7 (1 - \log_4 (x^2 - 9x + 18))$ is $(\alpha, \beta) \cup (\gamma, \delta)$, then $\alpha + \beta + \gamma + \delta$ is equal to
A) 18
B) 16
C) 15
D) 17
- Let f be a function such that $f(x) + 3f\left(\frac{24}{x}\right) = 4x$, $x \neq 0$. Then $f(3) + f(8)$ is equal to
A) 11
B) 10
C) 12
D) 13
- If the domain of the function $f(x) = \log_e\left(\frac{2x-3}{5+4x}\right) + \sin^{-1}\left(\frac{4+3x}{2-x}\right)$ is $[\alpha, \beta)$ then $\alpha^2 + 4\beta$ is equal to
A) 5
B) 4
C) 3
D) 7

10. If the domain of the function $f(x) = \frac{1}{\sqrt{10+3x-x^2}} + \frac{1}{\sqrt{x+|x|}}$ is (a, b) , then $(1+a)^2 + b^2$ is equal to :
- A) 26 B) 29 C) 25 D) 30
11. If the domain of the function $\log_5(18x - x^2 - 77)$ is (α, β) and the domain of the function $\log_{(x-1)}\left(\frac{2x^2+3x-2}{x^2-3x-4}\right)$ is (γ, δ) , then $\alpha^2 + \beta^2 + \gamma^2$ is equal to :
- A) 195 B) 179 C) 186 D) 174
12. Let $f(x) = \frac{2x^2+16}{2^{2x+1}+2^{x+4}+32}$. Then the value of $8\left(f\left(\frac{1}{15}\right) + f\left(\frac{2}{15}\right) + \dots + f\left(\frac{59}{15}\right)\right)$ is equal to
- A) 92 B) 118 C) 102 D) 108
13. Let $f(x) = \frac{1}{7-\sin 5x}$ be a function defined on R . Then the range of the function $f(x)$ is equal to:
- A) $\left[\frac{1}{8}, \frac{1}{5}\right]$ B) $\left[\frac{1}{7}, \frac{1}{6}\right]$ C) $\left[\frac{1}{7}, \frac{1}{5}\right]$ D) $\left[\frac{1}{8}, \frac{1}{6}\right]$
14. If the domain of the function $\sin^{-1}\left(\frac{3x-22}{2x-19}\right) + \log_e\left(\frac{3x^2-8x+5}{x^2-3x-10}\right)$ is $(\alpha, \beta]$, then $3\alpha + 10\beta$ is equal to :
- A) 97 B) 100 C) 95 D) 98
15. If the domain of the function $f(x) = \frac{\sqrt{x^2-25}}{(4-x^2)} + \log_{10}(x^2 + 2x - 15)$ is $(-\infty, \alpha) \cup [\beta, \infty)$, then $\alpha^2 + \beta^3$ is equal to :
- A) 140 B) 175 C) 150 D) 125
16. Let $f: R - \{2, 6\} \rightarrow R$ be real valued function defined as $f(x) = \frac{x^2+2x+1}{x^2-8x+12}$. Then range of f is
- A) $(-\infty, -\frac{21}{4}] \cup [0, \infty)$ B) $(-\infty, -\frac{21}{4}) \cup (0, \infty)$
C) $(-\infty, -\frac{21}{4}] \cup [\frac{21}{4}, \infty)$ D) $(-\infty, -\frac{21}{4}) \cup [1, \infty)$
17. The absolute minimum value, of the function $f(x) = |x^2 - x + 1| + [x^2 - x + 1]$, where $[t]$ denotes the greatest integer function, in the interval $[-1, 2]$, is :
- A) $\frac{3}{4}$ B) $\frac{3}{2}$ C) $\frac{1}{4}$ D) $\frac{5}{4}$
18. If the domain of the function $f(x) = \frac{[x]}{1+x^2}$, where $[x]$ is greatest integer $\leq x$, is $(2, 6)$, then its range is
- A) $\left(\frac{5}{26}, \frac{2}{5}\right] - \left\{\frac{9}{29}, \frac{27}{109}, \frac{18}{89}, \frac{9}{53}\right\}$ B) $\left(\frac{5}{26}, \frac{2}{5}\right]$
C) $\left(\frac{5}{37}, \frac{2}{5}\right] - \left\{\frac{9}{29}, \frac{27}{109}, \frac{18}{89}, \frac{9}{53}\right\}$ D) $\left(\frac{5}{37}, \frac{2}{5}\right]$
19. The domain of $f(x) = \frac{\log_{(x+1)}(x-2)}{e^{\log_e x - (2x+3)}}, x \in R$ is
- A) $R - \{1-3\}$ B) $(2, \infty) - \{3\}$ C) $(-1, \infty) - \{3\}$ D) $R - \{3\}$
20. The range of the function $f(x) = \sqrt{3-x} + \sqrt{2+x}$ is
- A) $[\sqrt{5}, \sqrt{10}]$ B) $[2\sqrt{2}, \sqrt{11}]$ C) $[\sqrt{5}, \sqrt{13}]$ D) $[\sqrt{2}, \sqrt{7}]$
21. Let $A = \{-2, -1, 0, 1, 2, 3, 4\}$. Let R be a relation on A defined by xRy if and only if $2x + y \leq 2$. Let l be the number of elements in R . Let m and n be the minimum number of elements required to be added in R to make it reflexive and symmetric relations respectively. Then $l + m + n$ is equal to:
- A) 32 B) 34 C) 33 D) 35
22. The domain of the function $f(x) = \frac{1}{\log_{10}(1-x)} + \sqrt{x+2}$ is
- A) $(-3, -2.5) \cup (-2.5, -2)$ B) $(-2, 0) \cup (0, 1)$
C) $(0, 1)$ D) None of these
23. Range of the function $f(x) = \frac{x^2+x+2}{x^2+x+1}; x \in R$ is
- A) $(1, \infty)$ B) $(1, 11/7]$ C) $(1, 7/3]$ D) $(1, 7/5]$

24. Let the function $f : [0, 1] \rightarrow R$ be defined by $f(x) = \frac{4^x}{4^x + 2}$. Then the value of $f\left(\frac{1}{40}\right) + f\left(\frac{2}{40}\right) + f\left(\frac{3}{40}\right) + \dots + f\left(\frac{39}{40}\right) + f\left(\frac{1}{2}\right)$ is.
- A) 19 B) 20 C) 25 D) 30
25. Domain of definition of the function $f(x) = \frac{3}{4-x^2} + \log_{10}(x^3 - x)$ is
- A) (1, 2) B) $(-1, 0) \cup (1, 2)$
- C) $(1, 2) \cup (2, \infty)$ D) $(-1, 0) \cup (1, 2) \cup (2, \infty)$

Maths - Section B (Numeric)

26. Let $A = \{1, 2, 3, \dots, 7\}$ and let $P(A)$ denote the power set of A . If the number of functions $f : A \rightarrow P(A)$ such that $a \in f(a), \forall a \in A$ is m^n , m and $n \in \mathbb{N}$ and m is least, then $m + n$ is equal to
27. Let the domain of the function $f(x) = \cos^{-1}\left(\frac{4x+5}{3x-7}\right)$ be $[\alpha, \beta]$ and the domain of $g(x) = \log_2(2 - 6\log_{27}(2x + 5))$ be (γ, δ) . Then $|7(\alpha + \beta) + 4(\gamma + \delta)|$ is equal to _____.
28. Let $R = \{(x, y) \in \mathbb{N} \times \mathbb{N} : \log_e(x + y) \leq 2\}$. Then the minimum number of elements, required to be added in R to make it a transitive relation, is _____.
29. If the domain of the function $f(x) = \sqrt{\log_{(0.6)}\left(\left|\frac{2x-5}{x^2-4}\right|\right)}$ is $(-\infty, a] \cup \{b\} \cup [c, d) \cup (e, \infty)$, then the value of $a + b + c + d + e$ is _____.
30. Let $A = \{1, 2, 3, 4, 5, 6\}$. The number of one-one functions $f : A \rightarrow A$ such that $f(1) \geq 3$, $f(3) \leq 4$ and $f(2) + f(3) = 5$, is _____.

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Maths - Section A (MCQ.)

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

Maths - Section B (Numeric.)

26 - 44	27 - 96	28 - 15	29 - 4	30 - 72
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