

MATHEMATICS LECTURES FOR IIT-JEE BY MANISH KALIA

Functions

JEE-MAINS (PREVIOUS YEAR)

MCQ-Single Correct

1. The function $f : R \rightarrow \left[-\frac{1}{2}, \frac{1}{2}\right]$ defined as $f(x) = \frac{x}{1+x^2}$, is :
- (1) invertible. (2) injective but not surjective.
(3) surjective but not injective. (4) neither injective nor surjective. [2017]
2. Let $a, b, c \in R$. If $f(x) = ax^2 + bx + c$ is such that $a + b + c = 3$ and $f(x+y) = f(x) + f(y) + xy \forall x, y \in R$, then $\sum_{n=1}^{10} f(n)$ is equal to :
- (1) 330 (2) 165
(3) 190 (4) 255 [2017]
3. If $f(x) + 2f\left(\frac{1}{x}\right) = 3x, x \neq 0$ and $S = \{x \in R : f(x) = f(-x)\}$; then S:
- (1) contains exactly one element. (2) contains exactly two elements.
(3) contains more than two elements (4) is an empty set [2016]
4. If $a \in R$ and the equation $-3(x - [x])^2 + 2(x - [x]) + a^2 = 0$ (where $[x]$ denotes the greatest integer $\leq x$) has no integral solution, then all possible values of a lie in the interval
- (1) $(-1, 0) \cup (0, 1)$ (2) $(1, 2)$
(3) $(-2, -1)$
(3) $\frac{1}{1 + \{g(x)\}^5}$ (4) $1 + \{g(x)\}^5$ [2014]
6. For real x , let $f(x) = x^3 + 5x + 1$, then
- (1) f is one-one but not onto R (2) f is onto R but not one-one

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- (3) f is one-one and onto \mathbb{R} (4) f is neither one-one nor onto \mathbb{R} [2009]
7. Let $f: \mathbb{N} \rightarrow Y$ be a function defined as $f(x) = 4x + 3$, where $Y = \{y \in \mathbb{N} : y = 4x + 3 \text{ for some } x \in \mathbb{N}\}$. Show that f is invertible and its inverse is
- (1) $g(y) = \frac{3y+4}{4}$ (2) $g(y) = 4 + \frac{y+3}{4}$
- (3) $g(y) = \frac{y+3}{4}$ (4) $g(y) = \log \left| \sin \left(x - \frac{\pi}{4} \right) \right| + c$ [2008]
8. 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
- (1) $[0, \pi]$ (2) $\left(-\frac{\pi}{2}, \frac{\pi}{2} \right)$
- (3) $\left[-\frac{\pi}{4}, \frac{\pi}{2} \right)$ (4) $\left[0, \frac{\pi}{2} \right)$ [2007]
9. Let $f: (-1, 1) \rightarrow B$, be a function defined by $f(x) = \tan^{-1} \left(\frac{2x}{1-x^2} \right)$, then f is both one-one and onto when B is the interval
- (1) $\left(0, \frac{\pi}{2} \right)$ (2) $\left[0, \frac{\pi}{2} \right)$
- (3) $\left[-\frac{\pi}{2}, \frac{\pi}{2} \right]$ (4) $\left(-\frac{\pi}{2}, \frac{\pi}{2} \right)$ [2005]
10. A real valued function $f(x)$ satisfies the functional equation $f(x-y) = f(x)f(y) - f(a-x)f(a+y)$ where a is a given constant and $f(0) = 1$, $f(2a-x)$ is equal to
- (1) $-f(x)$ (2) $f(x)$
- (3) $f(a) + f(a-x)$ (4) $f(-x)$ [2006]
11. The range of the function $f(x) = {}^{7-x}P_{x-3}$ is

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17. Domain of definition of the function $f(x) = \frac{3}{4-x^2} + \log_{10}(x^3 - x)$, is
- (1) (1,2) (2) $(-1,0) \cup (1,2)$
(3) $(1,2) \cup (2,\infty)$ (4) $(-1,0) \cup (1,2) \cup (2,\infty)$ [2003]
18. The function $f(x) = \log(x + \sqrt{x^2 + 1})$, is
- (1) an even function (2) an odd function
(3) a periodic function (4) neither an even nor an odd function [2003]
19. The period of $\sin^2 \theta$ is
- (1) π^2 (2) π
(3) π^3 (4) $\pi/2$ [2002]
20. Which one is not periodic
- (1) $|\sin 3x| + \sin^2 x$ (2) $\cos \sqrt{x} + \cos^2 x$
(3) $\cos 4x + \tan^2 x$ (4) $\cos 2x + \sin x$ [2002]
21. If $f(x+y) = f(x) \cdot f(y) \forall x, y$ and $f(5) = 2, f'(0) = 3$, then $f'(5)$ is
- (1) 0 (2) 1
(3) 6 (4) 2 [2002]
22. The domain of $\sin^{-1} \left[\log_3 \left(\frac{x}{3} \right) \right]$ is
- (1) [1,9] (2) [-1,9]
(3) [-9,1] (4) [-9,-1] [2002]

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Assertion – Reason Type

1. Let f be a function defined by $f(x) = (x-1)^2 + 1, (x \geq 1)$

Statement – I : The set $\{x : f(x) = f^{-1}(x)\} = \{1,2\}$.

Statement – II : f is bijection and $f^{-1}(x) = 1 + \sqrt{x-1}, x \geq 1$.

2. Let $f(x) = (x+1)^2 - 1, x \geq -1$

Statement – I : The set $\{x : f(x) = f^{-1}(x)\} = \{0,-1\}$

Statement – II : f is a bijection.

ALPHA CLASSES