MATHS

JEE MAINS & ADVANCED

CLASS - XII

MODULE – 01

Relations & Function | Inverse Trigonometric Functions | Continuity & Differentiability, Methods of Differentiation | Application of Derivatives

Video solution will be available soon..

Get complete class 12th JEE study material(hard copies) delivered at your home at the lowest cost of

Rs1299/- only

Order from book section of pw app

Physics Wallah

EDITION : 2021

Published By:

Physics Wallah

2nd Floor, A-1/12, West Paschim Vihar

New Delhi-110063

Mobile App:	**Physics Wallah (Available on Play Store)**
	http://bit.ly/3ru9Agh
Website:	**www.physicswallahalakhpandey.com**
	www.physicswallah.live
Youtube Channel:	**Physics Wallah - Alakh Pandey**
Email:	**support@physicswallah.org**

Q.29 Function $f(x) = \sin x + \tan x + \text{sgn}(x^2 - 6x + 10)$ is
(1) periodic with period 2π
(2) periodic with period π
(3) non-periodic
(4) periodic with period 4π

Q.30 The period of $f(x) = x - [x]$, if it is periodic, is
(1) $f(x)$ is not periodic (2) $\frac{1}{2}$
(3) 1 (4) 2

Inverse of function

Q.31 If $f(x) = x^3 - 1$ and domain of $f = \{0,1,2,3\}$, then domain of f^{-1} is -
(1) $\{0,1,2,3\}$ (2) $\{1,0,-7,-26\}$
(3) $\{-1,0,7,26\}$ (4) $\{0,-1,-2,-3\}$

Q.32 The inverse of the function $y = \frac{e^x - e^{-x}}{e^x + e^{-x}}$ is
(1) $\frac{1}{2}\log\frac{1+x}{1-x}$ (2) $\frac{1}{2}\log\frac{2+x}{2-x}$
(3) $\frac{1}{2}\log\frac{1-x}{1+x}$ (4) $2\log(1+x)$

Miscelloneous

Q.33 The function $f(x) = \sqrt{\log_{10}\cos(2\pi x)}$ exists -
(1) for any rational x
(2) only when x is a positive integer
(3) only when x is fractional
(4) for any integer value of x including zero

Q.34 Let A = N × N and * be the binary operation on A defined by (a, b) * (c, d) = (a + c, b + d). Find the identity element for * on A, if any.
(1) 1 (2) 2
(3) 3 (4) does not exists

Q.35 Number of binary operations on the set {a, b} are
(1) 2 (2) 2^2
(3) 2^3 (4) 2^4

EXERCISE-II

Scan for Video Solution

RELATIONS

Q.1 Let R be a reflexive relation on a set A and *I* be the identity relation on A. Then
(1) $R \subset I$ (2) $I \subset R$
(3) $R = I$ (4) $R = 2I$

Q.2 R is a relation over the set of real numbers and it is given by $nm \geq 0$. Then R is
(1) Symmetric and transitive
(2) Reflexive and symmetric
(3) A partial order relation
(4) An equivalence relation

Q.3 Let S be the set of all real numbers. Then the relation $R = \{(a, b) : 1 + ab > 0\}$ on S is
(1) Reflexive and symmetric but not transitive
(2) Reflexive and transitive but not symmetric
(3) Symmetric, transitive but not reflexive
(4) Reflexive, transitive and symmetric

Q.4 Let $R = \{(3,3),(6,6),(9,9),(12,12),(6,12),(3,9),(3,12),(3,6)\}$, be relation on the set $A = \{3, 6, 9, 12\}$. The relation is
(1) reflexive and transitive only
(2) reflexive only
(3) an equivalence relation
(4) reflexive and symmetric only

Q.5 Let W denote the words in the English dictionary. Define the relation Rby : $R = \{(x, y) \in W \times W \mid$ the words x and y have at least one letter in common$\}$. Then R is –
(1) reflexive, symmetric and not transitive
(2) reflexive, symmetric and transitive
(3) reflexive, not symmetric and transitive
(4) not reflexive, symmetric and transitive

Q.6 Let R and S be two non-void relations on a set A. Which of the following statements is false
(1) R and S are transitive $\Rightarrow R \cup S$ is transitive
(2) R and S are transitive $\Rightarrow R \cap S$ is transitive
(3) R and S are symmetric $\Rightarrow R \cup S$ is symmetric
(4) R and S are reflexive $\Rightarrow R \cap S$ is reflexive

Q.7 Let R be a relation on the set N be defined by $\{(x, y) | x, y \in N, 2x + y = 41\}$. Then R is
(1) Reflexive
(2) Symmetric
(3) Transitive
(4) Not Reflexive, symmetric, transitive

Q.8 Let R_1 be a relation defined by $R_1 = \{(a,b) | a \geq b, a, b \in R\}$. Then R_1 is
(1) An equivalence relation on R
(2) Reflexive, transitive but not symmetric
(3) Symmetric, Transitive but not reflexive
(4) Neither transitive not reflexive but symmetric

Q.9 The domain of the function $f(x) = \frac{\sin^{-1}(x-3)}{\sqrt{9-x^2}}$ is
(1) [1, 2) (2) [2, 3)
(3) [1, 2] (4) [2, 3]

Q.10 Range of $f(x) = \ell n(3x^2 - 4x + 5)$ is
(1) $\left[\ell n \frac{11}{3}, \infty\right)$ (2) $[\ell n\, 10, \infty)$
(3) $\left[\ell n \frac{11}{6}, \infty\right)$ (4) $\left[\ell n \frac{11}{12}, \infty\right)$

Q.11 Which of the following functions are not injective mapping-
(1) $f(x) = |x + 1|, x \in [-1, \infty)$
(2) $g(x) = x + \frac{1}{x}$; $x \in (0, \infty)$
(3) $h(x) = x^2 + 4x - 5$; $x \in (0, \infty)$
(4) $k(x) = e^{-x}$; $x \in [0, \infty)$

Q.12 The function $f: [2, \infty) \to Y$, defined by $f(x) = x^2 - 4x + 5$ is both one–one and onto if
(1) Y = R (2) Y = [1, ∞)
(3) Y = [4, ∞) (4) Y = [5, ∞)

Q.13 Let f: (e, ∞) → R be defined by $f(x) = \ell n(\ell n(\ell n\, x))$, then
(1) f is one one but not onto
(2) f is onto but not one – one
(3) f is one–one and onto
(4) f is neither one–one nor onto

Q.14 The function $f: R \to R$ defined by $f(x) = 6^x + 6^{|x|}$ is
(1) one-one and onto
(2) many-one and onto
(3) one-one and into
(4) many-one and into

Q.15 Let 'f' be a function from R to R given by $f(x) = \frac{x^2 - 4}{x^2 + 1}$. Then f(x) is
(1) one-one and into (2) one-one and onto
(3) many-one and into (4) many-one and onto

Q.16 Find the natural number 'a' for which $\sum_{k=1}^{n} f(a + k) = 16(2^n - 1)$, where the function 'f' satisfies the relation f(x + y) = f(x) f(y) for all natural numbers x, y and further f(1) = 2.
(1) 2 (2) 3 (3) 4 (4) 5

Q.17 If $f(x) = \cos\left[\frac{\pi^2}{2}\right]x + \sin\left[-\frac{\pi^2}{2}\right]x$, where [.] denotes the greatest integer function, then which of the following is not correct
(1) f(0) = 1 (2) $f\left(\frac{\pi}{3}\right) = \frac{1}{\sqrt{3}+1}$
(3) $f\left(\frac{\pi}{2}\right) = 0$ (4) f(π) = 0

Q.18 Which of the following pair of functions are identical–
(1) $f(x) = \sin^{-1} x + \cos^{-1} x$ and $g(x) = \frac{\pi}{2}$
(2) $f(x) = \tan^{-1} x + \cot^{-1} x$ and $g(x) = \frac{\pi}{2}$
(3) $f(x) = \sec^{-1} x + \text{cosec}^{-1} x$ and $g(x) = \frac{\pi}{2}$
(4) All of these

Q.19 If $f(x) = 2\sin^2\theta + 4\cos(x+\theta)\sin x.\sin\theta + \cos(2x+2\theta)$ then value of $f^2(x) + f^2\left(\frac{\pi}{4} - x\right)$ is
(1) 0 (2) 1 (3) –1 (4) x^2

Q.20 Let $f(x) = ax^2 + bx + c$, where a, b, c are rational and $f: Z \to Z$, where Z is the set of integers. Then a + b is
(1) a negative integer
(2) an integer
(3) non-integral rational number
(4) None of these

Q.21 Which one of the following pair of functions are identical ?
(1) $e^{(\ell n\, x)/2}$ and $\sqrt{x}$
(2) $\tan^{-1}(\tan x)$ & $\cot^{-1}(\cot x)$
(3) $\cos^2 x + \sin^4 x$ and $\sin^2 x + \cos^4 x$
(4) $\frac{|x|}{x}$ and sgn (x) where sgn(x) stands for signum function.

Q.22 If $f(x) = \cos(\ell n\, x)$, then $f(x)\, f(y) - \frac{1}{2}\left(f\left(\frac{x}{y}\right) + f(xy)\right)$ has the value

(1) –1 (2) $\frac{1}{2}$

(3) –2 (4) None of these

Q.23 If $y = f(x)$ satisfies the condition $f\left(x + \frac{1}{x}\right) = x^2 + \frac{1}{x^2}$ $(x \neq 0)$, then $f(x)$ is equal to

(1) $-x^2 + 2$ (2) $-x^2 - 2$

(3) $x^2 - 2, x \in R - \{0\}$ (4) $x^2 - 2, |x| \in [2, \infty)$

Q.24 If $f(1) = 1$ and $f(n + 1) = 2f(n) + 1$ if $n \geq 1$, then $f(n)$ is equal to

(1) $2^n + 1$ (2) 2^n

(3) $2^n - 1$ (4) $2^{n-1} - 1$

Q.25 A function $f : R \to R$ satisfies the condition $x^2 f(x) + f(1 - x) = 2x - x^4$. Then $f(x)$ is:

(1) $-x^2 - 1$ (2) $-x^2 + 1$

(3) $x^2 - 1$ (4) $-x^4 + 1$

Q.26 If x and y satisfy the equation $y = 2[x] + 3$ and $y = 3[x - 2]$ simultaneously, where $[\,.\,]$ denotes the greatest integer function, then $[x + y]$ is equal to

(1) 21 (2) 9

(3) 30 (4) 12

Q.27 The function $f(x)$ is defined in $[0, 1]$ then the domain of definition of the function $f[\ell n\,(1 - x^2)]$ is given by :

(1) $x \in \{0\}$

(2) $x \in [-\sqrt{1+e} - 1] \cup [1 + \sqrt{1+e}\,]$

(3) $x \in (-\infty, \infty)$

(4) None of these

Q.28 If 'f' and 'g' are bijective functions and gof is defined, then gof must be:

(1) injective (2) surjective

(3) bijective (4) into only

Q.29 Let $g(x) = 1 + x - [x]$ and $f(x) = \begin{cases} -1 & \text{if } x < 0 \\ 0 & \text{if } x = 0 \\ 1 & \text{if } x > 0 \end{cases}$, then $\forall$ x, fog(x) equals (where $[*]$ represents greatest integer function).

(1) x (2) 1

(3) f(x) (4) g(x)

Q.30 The function $f(x) = [x] + \frac{1}{2}$, $x \notin I$ is a/an (where $[\,.\,]$ denotes greatest integer function)

(1) Even

(2) odd

(3) neither even nor odd

(4) none of these

Q.31 It is given that f(x) is an even function and satisfy the relation $f(x) = \frac{x f(x^2)}{2 + \tan^2 x . f(x^2)}$ then the value of f(10) is

(1) 10 (2) 100

(3) 50 (4) None of these

Q.32 The period of $\sin\frac{\pi}{4}[x] + \cos\frac{\pi x}{2} + \cos\frac{\pi}{3}[x]$, where $[x]$ denotes the integral part of x is

(1) 8 (2) 12

(3) 24 (4) Non–periodic

Q.33 Let $f(x) = x(2 - x)$, $0 \leq x \leq 2$. If the definition of 'f' is extended over the set, $R - [0, 2]$ by $f(x + 2) = f(x)$, then 'f' is a

(1) periodic function of period 1

(2) non-periodic function

(3) periodic function of period 2

(4) periodic function of period 1/2

Q.34 Let $f : N \to N$ where $f(x) = x + (-1)^{x-1}$ then f is-

(1) Inverse of itself

(2) even function

(3) periodic

(4) identity

Q.35 If $[x]$ stands for the greatest integer function, then the value of

$$\left[\frac{1}{2} + \frac{1}{1000}\right] + \left[\frac{1}{2} + \frac{2}{1000}\right] + \ldots\ldots + \left[\frac{1}{2} + \frac{999}{1000}\right]$$

(1) 498 (2) 499

(3) 500 (4) 501

ABOUT PHYSICS WALLAH

Alakh Pandey is one of the most renowned faculty in NEET & JEE domain's Physics. On his YouTube channel, Physics Wallah, he teaches the Science courses of 11th and 12th standard to the students aiming to appear for the engineering and medical entrance exams.

YouTube

PW Alakh Pandey

Scan the QR Code to download our app PHYSICS WALLAH

- www.physicswallahalakhpandey.com | - www.physicswallah.live

- Physics Wallah - Alakh Pandey | - Physics Wallah - Alakh Pandey