

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

Rights All rights be reserved by Publisher. No part of this book may be used or reproduced in any manner whatsoever without the Written permission from author or publisher.

Disclaimer: Every effort has been taken in compiling/editing of the concerned data/information given in this book in various section, Also the question in books contain are memory based so it is possible to remain some mistake due to human error if so kindly compare the data with the government publication, journals and notification.

EXERCISE-IV



JEE-MAIN PREVIOUS YEAR'S

RELATIONS

Q.1 If $R = \{(x, y) ; x, y \in Z, x^2 + 3y^2 \leq 8\}$ is a relation on the set of integers Z , then the domain of R^{-1} is :

[JEE Main-2020 (September)]

- (1) $\{0, 1\}$ (2) $\{-2, -1, 1, 2\}$
- (3) $\{-1, 0, 1\}$ (4) $\{-2, -1, 0, 1, 2\}$

Q.2 Let R_1 and R_2 be two relation defined as follows :

[JEE Main-2020 (September)]

$R_1 = \{(a, b) \in R^2 : a^2 + b^2 \in Q\}$ and
 $R_2 = \{(a, b) \in R^2 : a^2 + b^2 \in Q\}$, where Q is the set of the rational numbers. Then :

- (1) Neither R_1 nor R_2 is transitive.
- (2) R_2 is transitive but R_1 is not transitive
- (3) R_1 and R_2 are both transitive.
- (4) R_1 is transitive but R_2 is not transitive.

FUNCTION

Q.3 If $f(x) + 2f\left(\frac{1}{x}\right) = 3x, x \neq 0$ and

$$S = \{x \in R : f(x) = f(-x)\}; \text{ then } S:$$

[JEE Main -2016]

- (1) is an empty set.
- (2) contains exactly one element
- (3) contains exactly two elements
- (4) contains more than two elements

Q.4 The function $f: R \rightarrow \left[-\frac{1}{2}, \frac{1}{2}\right]$ defined as $f(x) = \frac{x}{1+x^2}$,

is: [JEE Main - 2017]

- (1) neither injective nor surjective.
- (2) invertible.
- (3) injective but not surjective.
- (4) surjective but not injective

Q.5 Let $S = \{x \in R : x \geq 0 \text{ and}$

$$2|\sqrt{x} - 3| + \sqrt{x}(\sqrt{x} - 6) + 6 = 0\}. \text{ Then } S :$$

[JEE Main - 2018]

- (1) contains exactly one element.
- (2) contains exactly two elements.
- (3) contains exactly four elements.
- (4) is an empty set.

Q.6 For $x \in R - [0, 1]$, let $f_1(x) = \frac{1}{x}, f_2(x) = 1 - x$ and

$f_3(x) = \frac{1}{1-x}$ be three given functions. If a function,

$J(x)$ satisfies $(f_2 \circ f \circ f_1)(x) = f_3(x)$ then $J(x)$ is equal to :

[JEE Main - 2019 (January)]

- (1) $f_3(x)$ (2) $\frac{1}{x} f_3(x)$ (3) $f_2(x)$ (4) $f_1(x)$

Q.7 Let $A = \{x \in R : x \text{ is not a positive integer}\}$ Define a

function $f: A \rightarrow R$ as $f(x) = \frac{2x}{x-1}$ then f is

[JEE Main - 2019 (January)]

- (1) injection but not surjective
- (2) not injective
- (3) surjective but not injective
- (4) neither injective nor surjective

Q.8 Let N be the set of natural numbers and two functions f and g be defined as $f, g: N \rightarrow N$ such that

$$f(n) = \begin{cases} \frac{n+1}{2} & \text{if } n \text{ is odd} \\ \frac{n}{2} & \text{if } n \text{ is even} \end{cases}$$

and $g(n) = n - (-1)^n$. Then $f \circ g$ is:

[JEE Main - 2019 (January)]

- (1) onto but not one-one.
- (2) one-one but not onto.
- (3) both one-one and onto.
- (4) neither one-one nor onto.

Q.9 Let a function $f: (0, \infty) \rightarrow (0, \infty)$ be defined by $f(x) =$

$$\left|1 - \frac{1}{x}\right|. \text{ Then } f \text{ is: [JEE Main - 2019 (January)]}$$

- (1) not injective but it is surjective
- (2) injective only
- (3) neither injective nor surjective
- (4) both injective as well as surjective

Q.10 Let $f_k(x) = \frac{1}{k}(\sin^k x + \cos^k x)$ for $k = 1, 2, 3, \dots$. Then for all $x \in R$, the value of $f_4(x) - f_6(x)$ is equal to :

[JEE Main - 2019 (January)]

- (1) $1/12$ (2) $1/4$ (3) $-1/12$ (4) $5/12$

Q.11 Let $f(x) = a^x$ ($a > 0$) be written as $f(x) = f_1(x) + f_2(x)$, where $f_1(x)$ is an even function of $f_2(x)$ is an odd function. Then $f_1(x+y) + f_1(x-y)$ equals

[JEE Main - 2019 (April)]

- (1) $2f_1(x)f_1(y)$ (2) $2f_1(x)f_2(y)$
- (3) $2f_1(x+y)f_2(x-y)$ (4) $2f_1(x+y)f_1(x-y)$

Q.12 Let $\sum_{k=1}^{10} f(a+k) = 16(2^{10} - 1)$, where the function f satisfies $f(x+y) = f(x)f(y)$ for all natural numbers x, y and $f(1) = 2$ then the natural number 'a' is

[JEE Main - 2019(April)]

- (1) 4 (2) 3 (3) 16 (4) 2

Q.13 If the function $f: \mathbb{R} - \{1, -1\} \rightarrow A$ defined by

$$f(x) = \frac{x^2}{1-x^2}, \text{ is surjective, then } A \text{ is equal to}$$

[JEE Main - 2019(April)]

- (1) $\mathbb{R} - [-1, 0]$ (2) $\mathbb{R} - (-1, 0)$ (3) $\mathbb{R} - \{-1\}$ (4) $[0, \infty)$

Q.14 Let $f(x) = x^2, x \in \mathbb{R}$. For any $A \subseteq \mathbb{R}$, define $g(A) = \{x \in \mathbb{R}, f(x) \in A\}$. If $S = [0, 4]$, then which one of the following statements is not true? [JEE Main - 2019(April)]

- (1) $f(g(S)) \neq f(S)$ (2) $f(g(S)) = S$
 (3) $g(f(S)) = g(S)$ (4) $g(f(S)) \neq S$

Q.15 Let $f(x) = \log_e(\sin x), (0 < x < \pi)$ and $g(x) = \sin^{-1}(e^{-x}), (x \geq 0)$. If α is a positive real number such that $a = (f \circ g)(\alpha)$ and $b = (g \circ f)(\alpha)$, then:

[JEE Main - 2019(April)]

- (1) $a\alpha^2 - b\alpha - a = 0$ (2) $a\alpha^2 + b\alpha - a = -2\alpha^2$
 (3) $a\alpha^2 + b\alpha + a = 0$ (4) $a\alpha^2 - b\alpha - a = 1$

Q.16 For $x \in \left(0, \frac{3}{2}\right)$, let $f(x) = \sqrt{x}, g(x) = \tan x$ and

$$h(x) = \frac{1-x^2}{1+x^2}. \text{ If } \phi(x) = ((h \circ f) \circ g)(x), \text{ then } \phi = \left(\frac{\pi}{3}\right) \text{ is equal to:}$$

[JEE Main - 2019(April)]

- (1) $\tan \frac{\pi}{12}$ (2) $\tan \frac{7\pi}{12}$ (3) $\tan \frac{11\pi}{12}$ (4) $\tan \frac{5\pi}{12}$

Q.17 If $g(x) = x^2 + x - 1$ and $(g \circ f)(x) = 4x^2 - 10x + 5$, then

$$f\left(\frac{5}{4}\right) \text{ is equal to} \quad \text{[JEE Main-2020 (January)]}$$

- (1) $\frac{1}{2}$ (2) $-\frac{3}{2}$ (3) $-\frac{1}{2}$ (4) $\frac{3}{2}$

Q.18 The inverse function of $f(x) = \frac{8^{2x} - 8^{-2x}}{8^{2x} + 8^{-2x}}, x \in (-1, 1)$ is

[JEE Main-2020 (January)]

- (1) $\frac{1}{4} \log_e \left(\frac{1+x}{1-x}\right)$ (2) $\frac{1}{4} \log_e \left(\frac{1-x}{1+x}\right)$
 (3) $\frac{\log_8 e}{4} \log_e \left(\frac{1+x}{1-x}\right)$ (4) $\frac{\log_8 e}{4} \log_e \left(\frac{1-x}{1+x}\right)$

Q.19 Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a function which satisfies $f(x+y) = f(x)$

$$+ f(y) \forall x, y \in \mathbb{R}. \text{ If } f(1) = 2 \text{ and } g(n) = \sum_{k=1}^{(n-1)} f(k), n \in \mathbb{N}$$

then the value of n , for which $g(n) = 20$, is:

[JEE Main-2020 (September)]

Q.20 The domain of the function

$$f(x) = \sin^{-1} \left(\frac{|x|+5}{x^2+1} \right) \text{ is}$$

$(-\infty, -a] \cup [a, \infty)$. Then a is equal to:

[JEE Main-2020 (September)]

Q.21 Let $A = \{a, b, c\}$ and $B = \{1, 2, 3, 4\}$. Then the number of elements in the set $C = \{f: A \rightarrow B \mid 2 \in f(A) \text{ and } f \text{ is not one-one}\}$ is _____.

[JEE Main-2020 (September)]

Q.22 For a suitably chosen real constant a , let a function, $f:$

$$\mathbb{R} - \{-a\} \rightarrow \mathbb{R} \text{ be defined by } f(x) = \frac{a-x}{a+x}.$$

Further suppose that for any real number $x \neq -a$ and $f(x) \neq -a$,

$$(f \circ f)(x) = x. \text{ Then } f\left(-\frac{1}{2}\right) \text{ is equal to:}$$

[JEE Main-2020 (September)]

- (1) -3 (2) $\frac{1}{3}$ (3) $-\frac{1}{3}$ (4) 3

Q.23 If $\{p\}$ denotes the fractional part of the number p , then

$$\left\{ \frac{3^{200}}{8} \right\}, \text{ is equal to:}$$

[JEE Main-2020 (September)]

- (1) $\frac{5}{8}$ (2) $\frac{1}{8}$ (3) $\frac{7}{8}$ (4) $\frac{3}{8}$

Q.24 If $f(x+y) = f(x)f(y)$ and $\sum_{x=1}^{\infty} f(x) = 2, x, y \in \mathbb{N}$,

Where \mathbb{N} is the set of all natural numbers, then the

$$\text{value of } \frac{f(4)}{f(2)} \text{ is:}$$

[JEE Main-2020 (September)]

- (1) $\frac{1}{9}$ (2) $\frac{4}{9}$ (3) $\frac{1}{3}$ (4) $\frac{2}{3}$

JEE-ADVANCED PREVIOUS YEAR'S

Q.1 Let $f(x) = x^2$ and $g(x) = \sin x$ for all $x \in \mathbb{R}$. Then the set of all x satisfying $(f \circ g \circ g \circ f)(x) = (g \circ g \circ f)(x)$, where $(f \circ g)(x) = f(g(x))$, is [IIT JEE - 2011]

- (A) $\pm \sqrt{n\pi}, n \in \{0, 1, 2, \dots\}$
 (B) $\pm \sqrt{n\pi}, n \in \{1, 2, \dots\}$
 (C) $\frac{\pi}{2} + 2n\pi, n \in \{\dots, -2, -1, 0, 1, 2, \dots\}$
 (D) $2n\pi, n \in \{\dots, -2, -1, 0, 1, 2, \dots\}$

Q.2 The function $f: [0, 3] \rightarrow [1, 29]$, defined by $f(x) = 2x^3 - 15x^2 + 36x + 1$, is [IIT JEE-2012]

- (A) one-one and onto (B) onto but not one-one
 (C) one-one but not onto (D) neither one-one nor onto

Q.3 Let $f: (-1, 1) \rightarrow \mathbb{R}$ be such that $f(\cos 4\theta) = \frac{2}{2 - \sec^2 \theta}$ for $\theta \in \left(0, \frac{\pi}{4}\right) \cup \left(\frac{\pi}{4}, \frac{\pi}{2}\right)$. Then the value(s) of $f\left(\frac{1}{3}\right)$ is/are **[IIT JEE-2012]**

- (A) $1 - \sqrt{\frac{3}{2}}$ (B) $1 + \sqrt{\frac{3}{2}}$ (C) $1 - \sqrt{\frac{2}{3}}$ (D) $1 + \sqrt{\frac{2}{3}}$

Q.4 Let $f: \left(-\frac{\pi}{2}, \frac{\pi}{2}\right) \rightarrow \mathbb{R}$ be given by $f(x) = (\log(\sec x + \tan x))^3$. Then **[JEE Advanced-2014]**
 (A) $f(x)$ is an odd function
 (B) $f(x)$ is a one-one function
 (C) $f(x)$ is an onto function
 (D) $f(x)$ is an even function

Q.5 If $\alpha = 3\sin^{-1}\left(\frac{6}{11}\right)$ and $\beta = 3\cos^{-1}\left(\frac{4}{9}\right)$, where the inverse trigonometric functions take only the principal values, then the correct option(s) is/are **[JEE Advanced-2015]**

- (A) $\cos \beta > 0$ (B) $\sin \beta < 0$
 (C) $\cos(\alpha + \beta) > 0$ (D) $\cos \alpha < 0$

Q.6 Let the function $f: [0, 1] \rightarrow \mathbb{R}$ be defined by

$$f(x) = \frac{4^x}{4^x + 2}$$

Then the value of

$$f\left(\frac{1}{40}\right) + f\left(\frac{2}{40}\right) + f\left(\frac{3}{40}\right) + \dots + f\left(\frac{39}{40}\right) - f\left(\frac{1}{2}\right) \text{ is } \dots$$

[JEE(Advanced)-2020]

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