Relations and Functions

Q.No.1: The function $f : R \to \left[-\frac{1}{2}, \frac{1}{2}\right]$ defined as $f(x) = \frac{x}{1+x^2}$, is : **JEE 2017**

A. Invertible
B. injective but not surjective
C. surjective but not injective
D. neither injective nor surjective

Q.No.2: For $x \in \mathbf{R} - \{0, 1\}$, left $f_1(x) = \frac{1}{x}$, $f_2(x) = 1 - x$ and $f_3(x) = \frac{1}{1-x}$ be three given functions. If a function, $J(x)$ satisfies $(f_2 \circ J \circ f_1)(x) = f_3(x)$ then $J(x)$ is equal to: **JEE 2019**

A. $f_3(x)$
B. $\frac{1}{x} f_3(x)$
C. $f_2(x)$
D. $f_1(x)$

Q.No.3: Let A = $\{x \in R : x$ is not a positive integer$\}$. Define a function $f : A \to R$ as $f(x) = \frac{2x}{x-1}$, then f is: **JEE 2019**

A. not injective
B. neither injective nor surjective
C. surjective but not injective
D. injective but not surjective

Q.No.4: Let **N** be the set of natural numbers and two functions f and g be defined as $f, g : \mathbf{N} \to \mathbf{N}$ 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 *fog* is: **JEE 2019**

A. onto but not one-one.

B. one-one but not onto.

C. both one-one and onto.

D. neither one-one nor onto.

Q.No.5: Let a function $f:(0, \infty) \to (0, \infty)$ be defined by $f(x) = \left|1 - \frac{1}{x}\right|$. Then f is : **JEE 2019**

A. not injective but it is surjective

B. injective only

C. neither injective nor surjective

D. both injective as well as surjective

Q.No.6: If the function $f:$ **R** $-\{1, -1\} \longrightarrow$A defined by $f(x) = \frac{x^2}{1-x^2}$, is surjective, then A is equal to : **JEE 2019**

A. **R** $-\{-1\}$

B. $[0, \infty)$

C. **R** $-[-1,0)$

D. **R**$-(-1,0)$

Q.No.7: Let $f(x) = x^2$, $x \in$ **R**. For any $A \subseteq$ **R**, define $g(A) = \{x \in \mathbf{R} : f(x) \in A\}$. If $S = [0, 4]$, then which one of the following statements is not true ? **JEE 2019**

A. $g(f(S)) \neq S$

B. $f(g(S)) = S$

C. $g(f(S)) = g(S)$

D. $f(g(S)) \neq f(S)$

Q.No.8: Let $f(x) = \log_e(\sin x)$, $(0 < x < \pi)$ and $g(x)=\sin^{-1}(e^{-x})$,$(x \geq 0)$. If a is a positive real number such that $a = (fog)'(a)$ and $b = (fog)(a)$, then:

JEE 2019

A. $aa^2 + ba + a = 0$

B. $aa^2 - ba - a = 1$

C. $aa^2 - ba - a = 0$

D. $aa^2 + ba - a = -2a^2$

Q.No.9: For $x \in (0, 3/2)$ let $f(x) = \sqrt{x}$, $g(x) = \tan x$ and $h(x) = \frac{1-x^2}{1+x^2}$. If $\phi(x) = ((hof)og)(x)$, then $\phi\left(\frac{\pi}{3}\right)$ is equal to :

JEE 2019

A. $\tan\frac{\pi}{12}$

B. $\tan\frac{11\pi}{12}$

C. $\tan\frac{7\pi}{12}$

D. $\tan\frac{5\pi}{12}$

Q.No.10: Let $f: R \to R$ be defined as $f(x) = 2x - 1$ and $g: R-\{1\} \to R$ be defined as $g\left(x\right) = \frac{x-\frac{1}{2}}{x-1}$. Then the composition function $f(g(x))$ is

JEE 2021

A. neither one-one nor onto

B. neither one-one nor onto

C. both one-one and onto

D. both one-one and onto