Q 1 $\lim_{x\to 0}\frac{\cos(\tan x)-\cos x}{x^4} =$

(A) $\frac{1}{6}$ (B) $-\frac{1}{3}$

(C) $-\frac{1}{6}$ (D) $\frac{1}{3}$

Q 2 The value of $\lim_{x\to 0}\frac{(\sin x-\tan x)^2-(1-\cos 2x)^4+x^5}{7(\tan^{-1}x)^7+(\sin^{-1}x)^6+3\sin^5 x}$ equal to:

(A) 0 (B) 1

(C) 2 (D) $\frac{1}{3}$

Q 3 Let a $=\lim_{x\to 0}\frac{\ln(\cos 2x)}{3x^2}$, $b=\lim_{x\to 0}\frac{\sin^2 2x}{x(1-e^x)}$, $c=\lim_{x\to 1}\frac{\sqrt{x}-x}{\ln x}$. Then a,b,c satisfy :

(A) $a<b<c$ (B) $b<c<a$

(C) $a<c<b$ (D) $b<a<c$

Q 4 $\lim_{x\to 0}\frac{\sin(\pi\cos^2(\tan(\sin x)))}{x^2} =$

(A) π (B) $\frac{\pi}{4}$

(C) $\frac{\pi}{2}$ (D) None of these

Q 5 If $f(x)$ is a thrice differentiable function such that, $\lim_{x\to 0}\frac{f(4x)-3f(3x)+3f(2x)-f(x)}{x^3}=12$ then the value of $f''(0)$ ...

(A) 0 (B) 1

(C) 12 (D) 15

Q 6 If $f(x)=|\sin x-|\cos x||$, then $f'\left(\frac{7\pi}{6}\right)=$

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

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

Q 7 Let $f(x)=\begin{cases}\sin^2 x & , \text{x is rational}\\ -\sin^2 x & , \text{x is irrational}\end{cases}$ the set of points, where $f(x)$ is continuous, is :

(A) $\left\{(2n+1)\frac{\pi}{2}, n\in I\right\}$ (B) A null set

(C) $\{n\pi,\ n\in I\}$ (D) Set of all rational numbers

Q 8 If $f(x)=\cos(x^2-4[x]); 0<x<1$, (where [.] denotes greatest integer function) the $f'\left(\sqrt{\frac{\pi}{2}}\right)$ is equal to :

(A) $-\sqrt{\frac{\pi}{2}}$ (B) $\sqrt{\frac{\pi}{2}}$

(C) 0 (D) $\sqrt{\frac{\pi}{4}}$

Q 9 Let $g(x)$ be the inverse of $f(x)$ such that $f'(x)=\frac{1}{1+x^5}$, then $\frac{d^2(g(x))}{dx^2}$ is equal to :

(A) $\frac{1}{1+(g(x))^5}$ (B) $\frac{g'(x)}{1+(g(x))^5}$

(C) $5(g(x))^4(1+(g(x))^5)$ (D) $1+(g(x))^5$

Q 10 Let $f(x)=\begin{cases}\min(x,x^2) & x\ge 0\\ \max(2x,x-1) & x<0\end{cases}$, then which of the following is not true ?

(A) $f(x)$ is not differentiable at $x=0$ (B) $f(x)$ is not differentiable at exactly two points

(C) $f(x)$ is continuous at everywhere (D) $f(x)$ is strictly increasing $\forall x\in R$

Q 11 Let $f(x)=\begin{cases}\frac{1-\tan x}{4x-\pi} & x\ne\frac{\pi}{4}\\ \lambda & x=\frac{\pi}{4}\end{cases}; x\in\left[0,\frac{\pi}{2}\right)$. If $f(x)$ is $\left[0,\frac{\pi}{2}\right)$ ... qual to :

(A) 1 (B) 0.5

(C) -0.5 (D) -1

Q 12 If $e^{f(x)}=\log_e x$ and $g(x)$ is the inverse function of $f(x)$, then $g'(x)$ is equal to :

(A) e^x+x (B) $e^{e^{e^x}}$ e^{e^x} e^x

(C) e^{e^x+x} (D) e^{e^x}

Q 13 Rang of the function $f(x)=\log_2(2-\log_{\sqrt{2}}(16\sin^2 x+1))$ is :

(A) [0,1] (B) (b) $(-\infty,1]$

(C) (c) [-1,1] (D) (d) $(-\infty,\infty)$

Q 14 For a real number x, let [x] denotes the greatest integer less than or equal to x. let $f:R\to R$ be defined by $f(x)=2x+[x]+\sin x\cos x$. Then f is

(A) One-One but not onto (B) Onto but not one-one

(C) Both one - one and onto (D) Neither one - one nor onto

Q 15 . The true set of values of �k� for which $\sin^{-1}\left(\frac{1}{1+\sin^2 x}\right)=\frac{k\pi}{6}$ may have a solution is :

(A) $\left[\frac{1}{4},\frac{1}{2}\right]$ (B) [1,3]

(C) $\left[\frac{1}{6},\frac{1}{2}\right]$ (D) [2,4]

Q 16 If $f:(-\infty,2]\to(-\infty,4]$ where $f(x)=x(4-x)$, then $f^{-1}(x)$ is given by :

(A) $2-\sqrt{4-x}$ (B) $2+\sqrt{4-x}$

(C) $-2+\sqrt{4-x}$ (D) $-2-\sqrt{4-x}$

Q 17 The range of function $f(x) = [1+\sin x] + \left[2+\sin\frac{x}{2}\right] + \left[3+\sin\frac{x}{3}\right] + \dots + \left[n+\sin\frac{x}{n}\right], x \in [0, \pi], n \in N$ ([.] denotes integer function)

(A) $\left\{\frac{n^2+n-2}{2}, \frac{n(n+1)}{2}\right\}$ (B) $\left\{\frac{n(n+1)}{2}\right\}$

(C) $\left\{\frac{n(n+1)}{2}\right\}, \frac{n^2+n+2}{2}, \frac{n^2+n+4}{2}$ (D) $\left\{\frac{n(n+1)}{2}, \frac{n^2+n+2}{2}\right\}$

Q 18 which of following function is homogeneous ?

(A) $f(x) = x\sin y + y\sin x$ (B) $f(x) = xe^{\frac{y}{x}} + ye^{\frac{x}{y}}$

(C) $h(x) = \frac{xy}{x+y^2}$ (D) $\phi(x) = \frac{x - y\cos x}{y\sin x + y}$

Q 19 which of the following function is periodic with fundamental period π ?

(A) $f(x) = \cos x + \left[\left|\frac{\sin x}{2}\right|\right]$; where [.] denotes greatest integer function (B) $g(x) = \frac{\sin x + \sin 7x}{\cos x + \cos 7x} + |\sin x|$

(C) $h(x) = \{x\} + |\cos x|$; where {.} denotes fractional part function (D) $\phi(x) = |\cos x| + \text{In}(\sin x)$

Q 20 Let $f: N \to Z$ and $f(x) = \begin{cases} \frac{x-1}{2} ; & \text{when x is add} \\ -\frac{x}{2} ; & \text{when x is even} \end{cases}$ then :

(A) $f(x)$ is bijective (B) $f(x)$ is injective but not surjective

(C) $f(x)$ is not injective but surjective (D) $f(x)$ is neither injective nor surjective

Q 21 Let $g(x)$ be the inverse of $f(x) = \frac{2^{x+1} - 2^{1-x}}{2^x + 2^{-x}}$ then $g(x)$ be :

(A) $\frac{1}{2}\log_2\left(\frac{2+x}{2-x}\right)$ (B) $-\frac{1}{2}\log_2\left(\frac{2+x}{2-x}\right)$

(C) $\log_2\left(\frac{2+x}{2-x}\right)$ (D) $\log_2\left(\frac{2-x}{2+x}\right)$

Q 22 Let A ={1, 2, 3, 4} and $f: A \to A$ satisfy $f(1) = 2, f(2) = 3, f(3) = 4, f(4) = 1$. suppose $g: A \to A$ satisfies $g(1) = 3$ and $fog = gof$, then g =

(A) $\{(1,3),(2,1),(3,2),(4,4)\}$ (B) $\{(1,3),(2,4),(3,1),(4,2)\}$

(C) $\{(1,3),(2,2),(3,4),(4,3)\}$ (D) $\{(1,3),(2,4),(3,2),(4,1)\}$

Q 23 The function $f(x) = \left\{\frac{(x^{2n})}{(x^{2n}\,sgn\, x)^{2n+1}}\right\}\left(\frac{e^{\frac{1}{x}} - e^{-\frac{1}{x}}}{e^{\frac{1}{x}} + e^{-\frac{1}{x}}}\right)$ $x \neq 0$ $n \in N$ is :

(A) Odd function (B) Even function

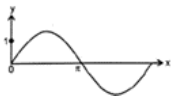
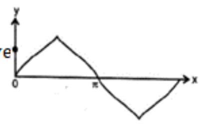
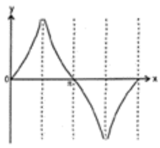
(C) Neither odd nor even function (D) Constant function

Q 24 A function $f: R \to R$ is defined as $f(x) = 3x^2 + 1$. Then $f^{-1}(x)$ is :

(A) $\frac{\sqrt{x-1}}{3}$ (B) $\frac{1}{3}\sqrt{x} - 1$

(C) f^{-1} does not exist (D) $\frac{\sqrt{x-1}}{3}$

Q 25 which of the following is closest to the graph of $y = \tan(\sin x), x > 0$?

(A) 
(B) 
(C) 
(D) 

Q 26 The complete set of x in the domain of function $f(x) = \sqrt{\log_{x+2}([x]^2 - 5[x] + 7)}$ (where [.] denote greatest integer function and {.} denote fraction part function) is :

(A) $\left(-\frac{1}{3}, 0\right) \cup \left(\frac{1}{3}, 1\right) \cup (2, \infty)$ (B) $(0,1) \cup (1, \infty)$

(C) $\left(-\frac{1}{3}, 0\right) \cup \left(\frac{1}{3}, 1\right) \cup (1, \infty)$ (D) $\left(\frac{1}{3}, 0\right) \cup \left(-\frac{1}{3}, 1\right) \cup (1, \infty)$