1. If the function $f(x)=\begin{cases}(1+|\cos x|)^{\frac{\lambda}{|\cos x|}}, & 0<x<\frac{\pi}{2}\\ \mu, & x=\frac{\pi}{2}\\ e^{\frac{\cot 6x}{\cot 4x}}, & \frac{\pi}{2}<x<\pi\end{cases}$ is continuous at $x=\frac{\pi}{2}$, then $9\lambda+6\log_e\mu+\mu^6-e^{6\lambda}$ is equal to

(1) 11
(2) 8
(3) $2e^4+8$
(4) 10

2. If the function $f(x)=\begin{cases}\frac{\log_e(1-x+x^2)+\log_e(1+x+x^2)}{\sec x-\cos x}, & x\in\left(\frac{-\pi}{2},\frac{\pi}{2}\right)-\{0\}\\ k & , x=0\end{cases}$ is continuous at $x=0$, then k is equal to:

(1) 1
(2) -1
(3) e
(4) 0

3. Let $a,b\in R, b\neq 0$. Defined a function, $f(x)=\begin{cases}a\sin\frac{\pi}{2}(x-1), & \text{for } x\leq 0\\ \frac{\tan 2x-\sin 2x}{bx^3}, & \text{for } x>0\end{cases}$ If f is continuous at $x=0$, then $10-ab$ is equal to

4. The function $f:R\to R$ defined by $f(x)=\lim\limits_{n\to\infty}\frac{\cos(2\pi x)-x^{2n}\sin(x-1)}{1+x^{2n+1}-x^{2n}}$ is continuous for all x in

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

5. Consider the function $f(x)=\frac{P(x)}{\sin(x-2)}$, $x\neq 2$, and $f(x)=7$, $x=2$ where $P(x)$ is a polynomial such that $P''(x)$ is always a constant and $P(3)=9$. If $f(x)$ is continuous at $x=2$, then $P(5)$ is equal to __________.

6. Let $[x]$ be the greatest integer $\leq x$. Then the number of points in the interval $(-2,\ 1)$ where the function $f(x)=|[x]|+\sqrt{x-[x]}$ is discontinuous, is _____.

7. Let $f(x)=[x^2-x]+|-x+[x]|$, where $x\in\mathbb{R}$ and $[t]$ denotes the greatest integer less than or equal to t. Then, f is

(1) continuous at $x=0$, but not continuous at $x=1$
(2) continuous at $x=1$, but not continuous at $x=0$
(3) continuous at $x=0$ and $x=1$
(4) not continuous at $x=0$ and $x=1$

8. If $f:R\to R$ is a function defined by $f(x)=[x-1]\cos\left(\frac{2x-1}{2}\right)\pi$, where $[\cdot]$ denotes the greatest integer function, then f is:

(1) discontinuous only at $x=1$
(2) discontinuous at all integral values of x except at $x=1$
(3) continuous only at $x=1$
(4) continuous for every real x

9. Let $[t]$ denote the greatest integer $\leq$ t. The number of points where the function $f(x)=[x]|x^2-1|+\sin\left(\frac{\pi}{[x]+3}\right)-[x+1]$, $x\in(-2,\ 2)$ is not continuous is _____.

10. Let $[t]$ denote the greatest integer $\leq t$ and $\lim\limits_{x\to 0}x\left[\frac{4}{x}\right]=A$. Then the function, $f(x)=[x^2]\sin(\pi x)$ is discontinuous, when x is equal to:

(1) $\sqrt{A+1}$
(2) $\sqrt{A+5}$
(3) $\sqrt{A+21}$
(4) $\sqrt{A}$

11. If $f(x)=\begin{cases}x+a, & x\leq 0\\ |x-4|, & x>0\end{cases}$ and $g(x)=\begin{cases}x+1, & x<0\\ (x-4)^2+b, & x\geq 0\end{cases}$ are continuous on R, then $(gof)(2)+(fog)(-2)$ is equal to:

(1) -10
(2) 10
(3) 8
(4) -8

12. Let $f(x)=[2x^2+1]$ and $g(x)=\begin{cases}2x-3, & x<0\\ 2x+3, & x\geq 0\end{cases}$, where $[t]$ is the greatest integer $\leq t$. Then, in the open interval $(-1,1)$, the number of points where fog is discontinuous is equal to ______.

13. The number of points where the function $f(x)=\begin{cases}|2x^2-3x-7| & \text{if } x\leqslant -1\\ [4x^2-1] & \text{if } -1<x<1\\ |x+1|+|x-2| & \text{if } x\geqslant 1\end{cases}$, where $[t]$ denotes the greatest integer $\leqslant t$, is discontinuous is ______

14. Let $[x]$ denote the greatest integer function and $f(x)=\max\{1+x+[x],\ 2+x,\ x+2[x]\}$, $0\leq x\leq 2$, where f is not continuous and n be the number of points in $(0,\ 2)$, where f is not differentiable. Then $(m+n)^2+2$ is equal to

(1) 2
(2) 11
(3) 6
(4) 3

15. Let $f(x)=\begin{cases}max(|x|,\ x^2), & |x|\leq 2\\ 8-2|x|, & 2<|x|\leq 4\end{cases}$. Let S be the set of points in the interval $(-4,\ 4)$ at which f is not differentiable. Then S

(1) equals $\{-2,\ -1,\ 0,\ 1,\ 2\}$
(2) equals $\{-2,\ 2\}$
(3) is an empty set
(4) equal $\{-2,\ -1,\ 1,\ 2\}$

16. Let $a\in\mathbb{Z}$ and $[t]$ be the greatest integer $\leq t$, then the number of points, where the function $f(x)=[a+13\ \sin x]$, $x\in(0,\pi)$ is not differentiable, is ____________

17. If $[t]$ denotes the greatest integer $\leq t$, then number of points, at which the function $f(x)=4|2x+3|+9\left[x+\frac{1}{2}\right]-12[x+20]$ is not differentiable in the open interval $(-20,20)$, is ______.

18. The function $f(x)=|x^2-2x-3|\cdot e^{9x^2-12x+4}$ is not differentiable at exactly :

(1) Four points
(2) Two points
(3) three points
(4) one point

19. If $f(x)=\begin{cases}\frac{1}{|x|} & ; \ |x|\geq 1\\ ax^2+b & ; \ |x|<1\end{cases}$ is differentiable at every point of the domain, then the values of a and b are respectively:

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

20. Let S be the set of points where the function, $f(x)=\left|2-|x-3|\right|, x\in \mathrm{R}$, is not differentiable. Then $\sum_{x\in S} f(f(x))$ equal to

21. The number of points, at which the function $f(x)=|2x+1|-3|x+2|+|x^2+x-2|, x\in R$ is not differentiable, is

22. Let K be the set of all real values of x where the function $f(x)=\sin|x|-|x|+2(x-\pi)\cos|x|$ is not differentiable. Then the set K is equal to :

(1) ϕ (an empty set)
(2) $\{\pi\}$
(3) $\{0\}$
(4) $\{0,\pi\}$

23. Let the functions $f:R\to R$ and $g:R\to R$ be defined as :

$f(x)=\begin{cases}x+2, & x<0\\ x^2, & x\geq 0\end{cases}$ and $g(x)=\begin{cases}x^3, & x<1\\ 3x-2, & x\geq 1\end{cases}$

Then, the number of points in R where $(fog)(x)$ is NOT differentiable is equal to :

(1) 3
(2) 1
(3) 0
(4) 2

24. Let $\sum_{k=1}^{10} f(a+k)=16\left(2^{10}-1\right)$, 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:

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

25. Let f be a differentiable function from R to R such that $|f(x)-f(y)|\leq 2|x-y|^{3/2}$, for all $x,y\in R$. If $f(0)=1$ then $\int_0^1 f^2(x)dx$ is equal to

(1) 0
(2) 1
(3) 2
(4) $\frac{1}{2}$

26. Let $f:(-2,\ 2)\to\mathbb{R}$ be defined by $f(x)=\begin{cases}x[x] & , \ -2<x<0\\ (x-1)[x] & , \ 0\leq x<2\end{cases}$ where $[x]$ denotes the greatest integer function. If m and n respectively are the number of points in $(-2,\ 2)$ at which $y=|f(x)|$ is not continuous and not differentiable, then $m+n$ is equal to ________.

27. Let f and g be twice differentiable functions on R such that $f''(x)=g''(x)+6x f'(1)=4g'(1)-3=9$

$f(2)=3\ g(2)=12$

Then which of the following is NOT true ?

(1) $g(-2)-f(-2)=20$
(2) If $-1<x<2$, then $|f(x)-g(x)|<8$
(3) $|f'(x)-g'(x)|<6\Rightarrow -1<x<1$
(4) There exists $x_0\in\left(1,\frac{3}{2}\right)$ such that $f(x_0)=g(x_0)$

28. Let $f:R\to R$ be a function defined by : $f(x)=\begin{cases}\max\limits_{t\leq x}\{t^3-3t\}; & x\leq 2\\ x^2+2x-6; & 2<x<3\\ [x-3]+9; & 3\leq x\leq 5\\ 2x+1; & x>5\end{cases}$

Where $[t]$ is the greatest integer less than or equal to t. Let m be the number of points where f is not differentiable and $I=\int_{-2}^{2} f(x)dx$. Then the ordered pair (m,I) is equal to

(1) $\left(3,\frac{27}{4}\right)$
(2) $\left(3,\frac{23}{4}\right)$
(3) $\left(4,\frac{27}{4}\right)$
(4) $\left(4,\frac{23}{4}\right)$

29. Let $f:[0,\infty)\to[0,3]$ be a function defined by $f(x)=\begin{cases}\max\{\sin t: 0\leq t\leq x\}, x\in[0,\pi]\\ 2+\cos x, x>\pi\end{cases}$. Then which of the following is true ?

(1) f is continuous everywhere but not differentiable exactly at one point in $(0,\infty)$
(2) f is differentiable everywhere in $(0,\infty)$
(3) f is not continuous exactly at two points in $(0,\infty)$
(4) f is continuous everywhere but not differentiable exactly at two points in $(0,\infty)$

30. Let $f:R\to R$ be a function defined as $f(x)=\begin{cases}3\left(1-\frac{|x|}{2}\right) & \text{if} \quad |x|\leq 2\\ 0 & \text{if} \quad |x|>2\end{cases}$.Let $g:R\to R$ be given by $g(x)=f(x+2)-f(x-2)$. If n and m denote the number of points in R where g is not continuous and not differentiable, respectively, then $n+m$ is equal to ________.