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TEST - 04

By O.P. GUPTA

MULTIPLE CHOICE TYPE QUESTIONS

For CBSE 2026 Exams - Mathematics (041) - Class 12

Topics : Continuity & Differentiability **Max. Marks : 50**

☑ ***Select the correct option in the followings. Each question carries 1 mark.***

Q01. The value of $\frac{d}{dx}\left[\sin^{-1}(\cos x)\right]$ is

(a) $\frac{\pi}{2}-x$ (b) -1 (c) 1 (d) 0

Q02. The value of $\frac{d}{dx}\left[\log_{10} x\right]$ is

(a) $\frac{1}{x}$ (b) $\frac{\log_e 10}{x}$ (c) $\frac{\log_{10} e}{x}$ (d) $\frac{x}{\log_e 10}$

Q03. Let $f(x)=|x|$. Then $Lf'(0)=$

(a) Not defined (b) 0 (c) 1 (d) -1

Q04. Let $f(x)=[x]$, where [ ] is a greatest integer function. Then $Rf'(1)=$

(a) 0 (b) 1 (c) -1 (d) Not defined

Q05. If $f(x)=\begin{cases} 2\cos x, & x\neq 0 \\ \log_e k, & x=0 \end{cases}$ is continuous at $x=0$, then value of k is

(a) 2 (b) e^2 (c) 2^e (d) $\frac{1}{2}$

Q06. If $f(x)=\begin{cases} \frac{\sin x + x\cos x}{\cos x}, & x\neq 0 \\ \lambda, & x=0 \end{cases}$ is continuous at $x=0$, then value of λ is

(a) 0 (b) -1 (c) 1 (d) 2

Q07. Let $y=\sin t$, $x=t$. Then $\frac{dy}{dx}$ is given by

(a) $\sin t$ (b) $\sec t$ (c) $-\cos t$ (d) $\cos t$

Q08. For $f(x)=x^x$, $f'(1)=$

(a) -1 (b) -2 (c) 0 (d) 1

Q09. If $f(x)=\sin^{-1}\frac{2x}{1+x^2}$, $-1<x<1$, then $f'(x)=$

(a) $\frac{1}{1+x^2}$ (b) $\frac{1}{2(1+x^2)}$ (c) $\frac{2}{1+x^2}$ (d) $-\frac{2}{1+x^2}$

Q10. Total number of points at which the function $f(x)=e^x \log|x|$ is discontinuous, is

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(a) 0 (b) 1 (c) 2 (d) $R-\{0\}$

Q11. Value of the constant 'k' so that the function $f(x)=\begin{cases}\frac{k|x|}{x}, \text{ if } x>0\\ 3, \text{ if } x\le 0\end{cases}$ is continuous at $x=0$, is

(a) -3 (b) 3 (c) $-\frac{1}{\sqrt{2}}$ (d) $-\frac{\pi}{4}$

Q12. Let $f(x)=\begin{cases}\frac{\log(1+2x)-\log(1-3x)}{x}, \text{ if } x\ne 0\\ k, \text{ if } x=0\end{cases}$ be continuous at $x=0$. Then $k=$

(a) 1 (b) -5 (c) 0 (d) 5

Q13. If $x\in R-(-1,1)$, then $\frac{d}{dx}(\text{cosec}^{-1}x)=$

(a) $-\frac{1}{x\sqrt{1-x^2}}$ (b) $\frac{1}{x\sqrt{x^2-1}}$ (c) $-\frac{1}{x\sqrt{x^2-1}}$ (d) $\frac{1}{x\sqrt{1-x^2}}$

Q14. If $\pi<x<2\pi$, then $\frac{d}{dx}\left(\tan^{-1}\sqrt{\frac{1+\cos x}{1-\cos x}}\right)=$

(a) $-\frac{1}{2}$ (b) -1 (c) $\frac{1}{2}$ (d) 1

Q15. The function $f(x)=\begin{cases}2x-1, \; x<\frac{1}{2}\\ 3-6x, \; x\ge\frac{1}{2}\end{cases}$ is

(a) differentiable at $x=\frac{1}{2}$ as, $Lf'\left(\frac{1}{2}\right)=2=Rf'\left(\frac{1}{2}\right)$

(b) not differentiable at $x=\frac{1}{2}$ as, $Lf'\left(\frac{1}{2}\right)=-2\ne Rf'\left(\frac{1}{2}\right)=2$

(c) not differentiable at $x=\frac{1}{2}$ as, $Lf'\left(\frac{1}{2}\right)=2\ne Rf'\left(\frac{1}{2}\right)=-6$

(d) discontinuous at $x=\frac{1}{2}$ as, $f\left(\frac{1}{2}\right)\ne \lim_{x\to\frac{1}{2}} f(x)$

Q16. If the function given by $f(x)=\begin{cases}x^2+3x+a, \text{ if } x\le 1\\ bx+2, \text{ if } x>1\end{cases}$ is differentiable at $x=1$, then

(a) $a-b+2=0$ (b) $a+b+2=0$ (c) $a-b-2=0$ (d) $a-2b=0$

Q17. Let $f(x)=\begin{cases}\frac{x+\sin x}{\sin(k+1)x}, \text{ if } -\pi<x<0\\ 2, \text{ if } x=0\\ 2\frac{e^{\sin\lambda x}-1}{\lambda x}, \text{ if } x>0\end{cases}$ be a continuous function at $x=0$. Then $k=$

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(a) 0 (b) $\mathbb{R}-\{0\}$ (c) $\mathbb{R}$ (d) 1

Q18. If $f(x)=\begin{cases}\dfrac{2-2\cos 2x}{x^2}; & x<0\\ k; & x=0\\ \dfrac{\sqrt{x}}{\sqrt{4+\sqrt{x}}-2}; & x>0\end{cases}$ is continuous function at $x=0$, then $k=$

(a) 16 (b) -4 (c) 4 (d) 1

Q19. If $y=x^{e^{-x^2}}$, then $\left(\dfrac{dy}{dx}\right)_{\text{at } x=1}$ is

(a) $-e$ (b) e (c) 0 (d) e^{-1}

Q20. If $y=\sqrt{\log x+\sqrt{\log x+\sqrt{\log x+\ldots \text{ to } \infty}}}$, then $(2y-1)\dfrac{dy}{dx}=$

(a) x (b) $-\dfrac{x}{2}$ (c) $\dfrac{x}{2}$ (d) $\dfrac{1}{x}$

Q21. If $x=a\sec\theta,\ y=b\tan\theta$, and $\dfrac{d^2y}{dx^2}=k\left(\dfrac{b^4}{a^2y^3}\right)$, then k must be

(a) 1 (b) -1 (c) 0 (d) 2

Q22. If $y=\tan^{-1}\dfrac{3x-x^3}{1-3x^2}$, then $\dfrac{dy}{dx}=$

(a) $-\dfrac{3}{1+x^2}$ (b) $\dfrac{3}{1+x^2}$ (c) $\dfrac{1}{1+x^2}$ (d) $-\dfrac{1}{1+x^2}$

Q23. If $y=\sin t$, then $\dfrac{d^2y}{dt^2}$ at $t=\dfrac{\pi}{4}$ is

(a) $-\dfrac{1}{\sqrt{2}}$ (b) $\dfrac{1}{\sqrt{2}}$ (c) -1 (d) 1

Q24. For $\tan y=\dfrac{2t}{1-t^2}$, $\sin x=\dfrac{2t}{1+t^2}$, $\dfrac{dy}{dx}=$

(a) 2 (b) 0 (c) 1 (d) -1

Q25. If $x=\cos t$ and $y=\log t$ then, $\dfrac{d^2y}{dx^2}+\left(\dfrac{dy}{dx}\right)^2$ at $t=\dfrac{\pi}{2}$ will be

(a) 2 (b) 0 (c) 1 (d) -1

Q26. If $y=\cot^{-1}x$, then

(a) $\dfrac{dy}{dx}=\dfrac{1}{1+x^2}$ (b) $\dfrac{d^2y}{dx^2}=-\dfrac{2x}{(1+x^2)^2}$ (c) $\dfrac{d^2y}{dx^2}=\dfrac{2x}{(1+x^2)^2}$ (d) $\dfrac{dy}{dx}=-\dfrac{1}{1-x^2}$

Q27. The derivative of $\tan^{-1}\left(\dfrac{\sqrt{1-x^2}}{x}\right)$ with respect to $\cos^{-1}[2x\sqrt{1-x^2}]$, $0<x\le\dfrac{1}{\sqrt{2}}$ is

(a) $\frac{1}{2}$ (b) 1 (c) 0 (d) $-\frac{1}{2}$

Q28. If $x^2+y^2=t-\frac{1}{t}$, $x^4+y^4=t^2+\frac{1}{t^2}$ and $\frac{dy}{dx}=\frac{1}{x^{\alpha}y^{\beta}}$, then $\alpha+\beta=$

(a) 1 (b) 2 (c) 3 (d) 4

Q29. If $x=\sqrt{a^{\sin^{-1}t}}$, $y=\sqrt{a^{\cos^{-1}t}}$, then $\frac{dy}{dx}=$

(a) $-\frac{y}{x}$ (b) $\frac{y}{x}$ (c) $\frac{x}{y}$ (d) $-\frac{x}{y}$

Q30. If $x=2\cos\theta-\cos 2\theta$ and $y=2\sin\theta-\sin 2\theta$, then $\frac{dy}{dx}=$

(a) $\tan\frac{\theta}{2}$ (b) $\tan\frac{3\theta}{2}$ (c) $\tan 3\theta$ (d) $\cot\frac{3\theta}{2}$

Q31. If $x=a\sin pt$ and, $y=b\cos pt$. Then $\frac{d^2y}{dx^2}$ at $t=0$ is

(a) $-\frac{b}{a^2}$ (b) $\frac{b}{a^2}$ (c) $\frac{a^2}{b}$ (d) $-\frac{a^2}{b}$

Q32. If $e^y(x+1)=1$ and $\frac{d^2y}{dx^2}=\left(\frac{dy}{dx}\right)^k$ then $k=$

(a) 0 (b) 1 (c) 2 (d) 3

Q33. If $y=\sin^{-1}x$, then $(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}=$

(a) 0 (b) 1 (c) 2 (d) 3

Q34. $\frac{d}{dx}\left[\tan^{-1}\left(\frac{x+1}{x-1}\right)+\tan^{-1}\left(\frac{x-1}{x+1}\right)\right]=$

(a) -1 (b) 1 (c) 2 (d) 0

Q35. If $y=\log_{\sin x}\sqrt{\sin x}$, then $\frac{dy}{dx}=$

(a) 0 (b) 1 (c) 2 (d) -1

Q36. The derivative of $f(x)=|x-5|$ at $x=2$

(a) is 0 (b) is 1 (c) is -1 (d) does not exist

Q37. The derivative of $\sin^2(x^2)$ w.r.t. x^2 is

(a) $-\sin(2x^2)$ (b) $-2\sin(x^2)$ (c) $\sin(2x^2)$ (d) $2\sin(x^2)$

Q38. If $f(x)=x+1$, then $\frac{d}{dx}[(fof)(x)]=$

(a) 0 (b) 1 (c) 2 (d) -1

Q39. The differential coefficient of $f(\ln x)$ where $f(x)=\ln x$ is

(a) $(x\ln x)^{-1}$ (b) $x\ln x$ (c) $(\ln x)^{-1}$ (d) $x\ln x^{-1}$

Q40. Given that $f(x)=\sqrt{x\log_e x}$, then the value of $f'(e)$ is

(a) $\sqrt{e}$ (b) $\frac{1}{e}$ (c) e (d) $\frac{1}{\sqrt{e}}$

Q41. If $e^y(x+1)=1$, then $\frac{dy}{dx}=$

(a) e^y (b) $-e^y$ (c) $-e^{-y}$ (d) e^{-y}

Q42. The function $f(x)=[x]$, where $[x]$ is the greatest integer function that is less than or equal to x, is continuous at

(a) 4 (b) −2 (c) 1.5 (d) 1

Q43. If $y^2(2-x)=x^3$, then $\left(\frac{dy}{dx}\right)_{(1,\,1)}$ is equal to

(a) 2 (b) −2 (c) 3 (d) $-\frac{3}{2}$

Q44. If $y=e^{-x}$, then $\frac{d^2y}{dx^2}$ is equal to

(a) $-y$ (b) y (c) x (d) $-x$

Q45. If $x=t^2+1,\ y=2at$, then $\frac{d^2y}{dx^2}$ at $t=a$ is

(a) $-\frac{1}{a}$ (b) $-\frac{1}{2a^2}$ (c) $\frac{1}{2a^2}$ (d) 0

Q46. The function $f(x)=\begin{cases} x^2 & \text{for } x<1 \\ 2-x & \text{for } x\ge 1 \end{cases}$ is

(a) not differentiable at $x=1$
(b) differentiable at $x=1$
(c) not continuous at $x=1$
(d) neither continuous nor differentiable at $x=1$

*Question numbers **47** to **50** are Assertion and Reason based questions. Two statements are given, one labelled **Assertion (A)** and the other labelled **Reason (R)**. Select the correct answer from the codes (a), (b), (c) and (d) as given below.*

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true and Reason (R) is **not** the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

Q47. **Assertion (A) :** If $y=\sin(2\sin^{-1}x)$, then $(1-x^2)y_2=xy_1-4y$.

Reason (R) : $\frac{d}{dx}\left[\log\left(\frac{1+x}{1-x}\right)\right]=\frac{2}{1-x^2}$.

Q48. **Assertion (A) :** The function $f:\mathbb{R}\to\mathbb{R}$ given by $f(x)=-|x-1|$ is continuous but not differentiable at $x=1$.

Reason (R) : If a function $f(x)$ is discontinuous at $x=c$, then it may or may not be differentiable at this point $x=c$.

Q49. **Assertion (A) :** If $\sec^{-1}\left(\frac{1+x}{1-y}\right)=a$, then $\frac{dy}{dx}=\frac{y+1}{x-1}$.

Reason (R) : $\frac{d}{dx}\left[\sec^{-1}x\right]=\frac{1}{x\sqrt{x^2-1}}$, where $x\in R-[-1,1]$.

Q50. **Assertion (A) :** If $x=e^t\sin t, y=e^t\cos t$, then the value of $\frac{dy}{dx}$ at $t=\frac{\pi}{4}$ is 0.

Reason (R) : Second order derivative of a function y w.r.t. x can be denoted as $\frac{d^2y}{dx^2}=\frac{d}{dx}\left(\frac{dy}{dx}\right)$.

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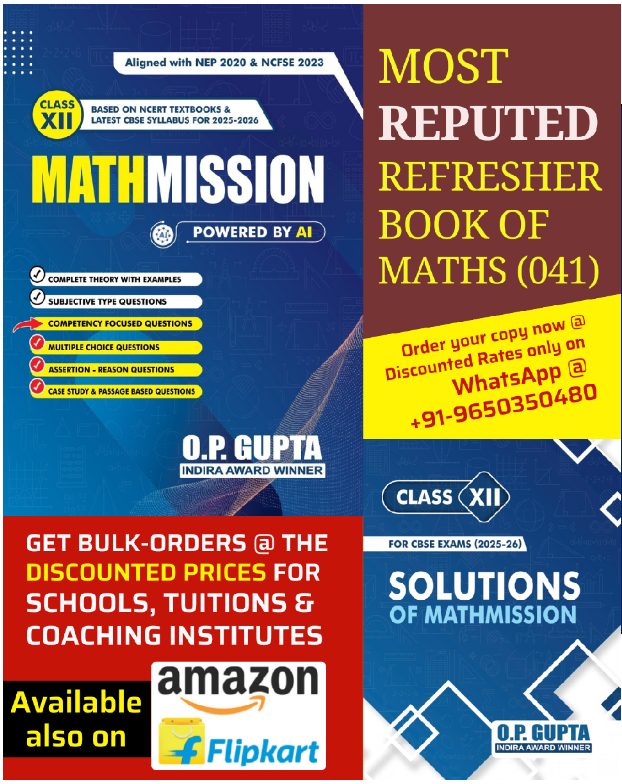

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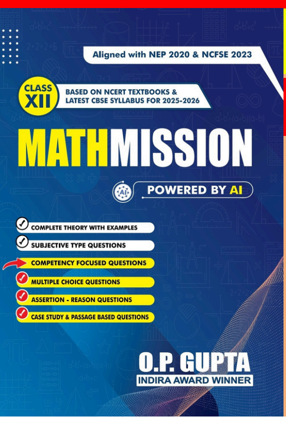

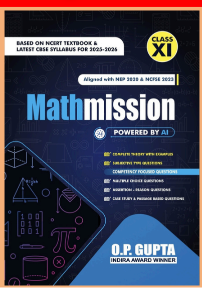

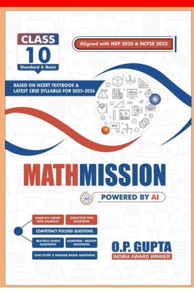

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