EdLoop JEE

MATHEMATICS · JEE MAIN

Limits, Continuity & Differentiability

Previous Year Questions with answers

285 questions · **186** papers · **2002–2026** · newest paper first

Step-by-step solutions for every question: free in the EdLoop JEE app (Google Play) · pyq.edloop.in

What is in this PDF: every Limits, Continuity & Differentiability question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

Step-by-step solutions for every question are free in the EdLoop JEE app (Google Play) and on app.edloop.in. More chapters: pyq.edloop.in/free-pdfs/

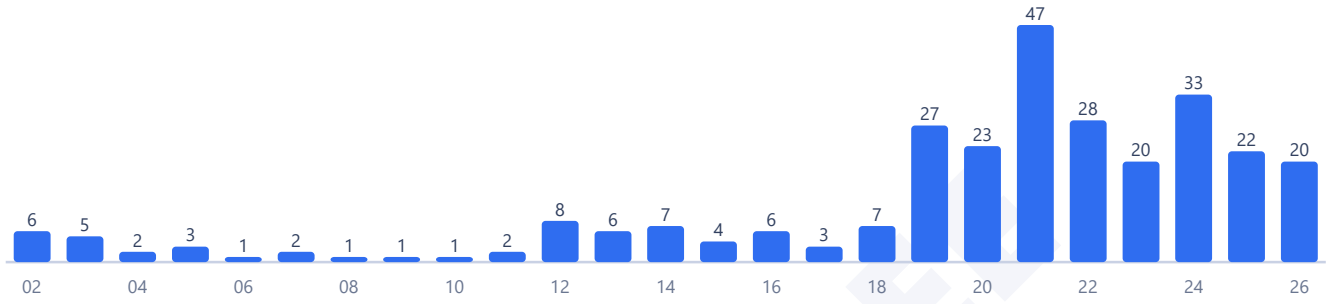
EdLoop

Chapter at a glance

4.8%	285	148 of 162	226 / 59
of Mathematics questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Steady: 1.3 questions per paper in 2024–2026 against 1.4 in 2019–2023.

Questions per year



Counts are the questions we hold: 285 in 186 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2002–2026)



How often it comes up

Limits, continuity and differentiability forms the foundational bedrock of differential calculus under Unit 7: Limit, Continuity and Differentiability in the Class 12 curriculum, securing rank 7 among the 29 chapters in the subject. Between 2019 and 2026, this chapter contributed 220 questions across 162 papers, representing 4.8 percent of all mathematics questions. It appeared in 148 of those 162 papers and has been tested every single year since 2019. In the recent three-year window from 2024 to 2026, it maintained an identical subject share of 4.8 percent, delivering 75 questions across 58 papers at a steady rate of 1.3 questions per paper. Historical comparison reveals that both the shift from the 2002 to 2018 share of 5.0 percent to 2024 to 2026 and the comparison between 2019 to 2026 and 2024 to 2026 are about the same. Across the entire 2002 to 2026 span of 200 papers, 285 questions were asked across 186 shifts, with 59 numerical answer questions appearing between 2019 and 2026.

Calculus questions on limits and local behaviour appear in almost every test sitting. The annual totals during 2024, 2025, and 2026 were 33, 22, and 20 questions respectively.

Because testing whether a function is continuous or differentiable requires evaluating one-sided limits, examiner problems frequently blend all three concepts into a unified piecewise problem. Furthermore, many questions appear in the numerical section, requiring exact parameter determination without relying on multiple-choice elimination.

Most-asked topics

Questions distribute across three central subtopics:

1. **Limits (108 questions, 2019-2026; 138 total, last asked 2026)** The primary core of the chapter focuses on indeterminate forms such as zero over zero, infinity over infinity, and one raised to infinity. Problems test algebraic factorisation, rationalisation, standard trigonometric and exponential limit expansions, Taylor series expansions, and L'Hopital's rule.

2. **Continuity (58 questions, 2019-2026; 74 total, last asked 2026)** Involves identifying points where a given expression fails to be continuous, analysing greatest integer functions, fractional part functions, and composite functions. A common format requires finding unknown coefficients that force a piecewise function to remain continuous across partition boundaries.

3. **Differentiability (54 questions, 2019-2026; 73 total, last asked 2026)** Examines corner points, cusps, and differentiability criteria using left-hand and right-hand derivative definitions. Questions frequently feature absolute values, maxima and minima of function families, or products of smooth functions with non-differentiable factors.

What the questions look like

Examiners repeatedly use several dependable question architectures:

- **Indeterminate Limits with Parameter Determination**: You are given that an expression tending to an indeterminate form approaches a finite nonzero value. By comparing coefficients in Taylor series expansions or repeatedly differentiating, you solve for multiple unknown constants.
- **Piecewise Differentiability at Junctions**: A function is defined by two different polynomial or trigonometric branches on either side of a boundary point. Enforcing continuity and equality of left-hand and right-hand derivatives provides simultaneous equations for unknown parameters.
- **Greatest Integer and Absolute Value Jump Analysis**: Functions involving floor brackets or moduli over a given closed interval require counting the exact number of points where continuity breaks or where the graph develops sharp corners.
- **Exponential Indeterminate Form**: Expressions where the base tends to unity while the exponent grows without bound are resolved using exponential conversion and standard asymptotic limits.

How to practise it

Building consistency in limits and differentiability depends on choosing the cleanest analytical route:

- **Master Maclaurin expansions**: For limits involving sine, cosine, tangent, exponential, and logarithm functions as x approaches zero, series expansions almost always outpace multiple rounds of differentiation. Retain terms up to the lowest power present in the denominator.
- **Differentiate definitions carefully**: When testing differentiability for functions involving absolute values or floor brackets, avoid applying standard derivative formulas blindly. Always return to the fundamental difference quotient definition to evaluate one-sided limits at critical points.
- **Check continuity before differentiability**: Remember that a function cannot be differentiable at a point where it is discontinuous. Always confirm that the left-hand limit, right-hand limit, and functional value coincide before examining derivative slopes.
- **Handle floor functions at integer inputs**: Remember that greatest integer expressions can create jump discontinuities wherever the internal argument assumes integer values, unless multiplying factors vanish sufficiently to absorb the jump.

Q1 JEE Main 2026 · 8 Apr · Shift 2 MCQ

For the function $f(x) = e^{\sin|x|} - |x|$, $x \in \mathbf{R}$, consider the following statements :

Statement I : f is differentiable for all $x \in \mathbf{R}$.

Statement II : f is increasing in $\left(-\pi, -\frac{\pi}{2}\right)$.

In the light of the above statements, choose the **correct** answer from the options given below :

(A) Both **Statement I** and **Statement II** are true
(B) Both **Statement I** and **Statement II** are false
(C) **Statement I** is true but **Statement II** is false
(D) **Statement I** is false but **Statement II** is true

Answer: (A) Both **Statement I** and **Statement II** are true · Official NTA final key

Q2 JEE Main 2026 · 8 Apr · Shift 2 MCQ

Let $f(x) = \begin{cases} \frac{1}{3}, & x \le \frac{\pi}{2} \\ \frac{b(1-\sin x)}{(\pi-2x)^2}, & x > \frac{\pi}{2} \end{cases}$. If f is continuous at $x = \pi/2$, then the value of $\int_0^{3b-6} |x^2 + 2x - 3|\, dx$ is :

(A) 5
(B) 2
(C) 3
(D) 4

Answer: (D) 4 · Official NTA final key

Q3 JEE Main 2026 · 6 Apr · Shift 1 MCQ

The value of $\lim_{x\to 0}\left(\frac{x^2\sin^2 x}{x^2 - \sin^2 x}\right)$ is:

(A) 2
(B) 3
(C) 4
(D) 6

Answer: (B) 3 · Official NTA final key

Q4 JEE Main 2026 · 6 Apr · Shift 2 Numerical

Let $f(x) = \begin{cases} x^3 + 8; & x < 0, \\ x^2 - 4; & x \ge 0, \end{cases}$ and $g(x) = \begin{cases} (x-8)^{1/3}; & x < 0, \\ (x+4)^{1/2}; & x \ge 0. \end{cases}$

Then the number of points, where the function $g \circ f$ is discontinuous, is _____.

Numerical value type: the answer is a number.

Answer: 3. · Official NTA final key

Q5 JEE Main 2026 · 5 Apr · Shift 1 MCQ

The product of all possible values of α, for which $\lim_{x\to 0}\left(\frac{1-\cos(\alpha x)\cos((\alpha+1)x)\cos((\alpha+2)x)}{\sin^2((\alpha+1)x)}\right)=2$, is:

(A) -2
(B) 1
(C) -1
(D) $\frac{5}{4}$

Answer: (C) -1 · Official NTA final key

Q6 JEE Main 2026 · 5 Apr · Shift 2 MCQ

Let $f(x)=\lim_{y\to 0}\frac{(1-\cos(xy))\tan(xy)}{y^3}$. Then the number of solutions of the equation $f(x)=\sin x$, $x\in\mathbf{R}$ is :

(A) 0
(B) 2
(C) 3
(D) 1

Answer: (C) 3 · Official NTA final key

Q7 JEE Main 2026 · 4 Apr · Shift 1 Numerical

The number of points, at which the function $f(x)=\max\{6x,\ 2+3x^2\}+|x-1|\cos\left|x^2-\frac{1}{4}\right|$, $x\in(-\pi,\pi)$, is not differentiable, is _____.

Numerical value type: the answer is a number.

Answer: 3. · Official NTA final key

Q8 JEE Main 2026 · 4 Apr · Shift 2 Numerical

Let $f(x)=\begin{cases}e^{x-1}, & x<0\\ x^2-5x+6, & x\geq 0\end{cases}$ and $g(x)=f(|x|)+|f(x)|$. If the number of points where g is not continuous and is not differentiable are α and β respectively, then $\alpha+\beta$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 4. · Official NTA final key

Q9 JEE Main 2026 · 2 Apr · Shift 1 MCQ

If $\lim_{x\to 2}\frac{\sin\left(x^3-5x^2+ax+b\right)}{\left(\sqrt{x-1}-1\right)\log_e(x-1)}=m$, then $a+b+m$ is equal to :

(A) 5
(B) 6
(C) 8
(D) 10

Answer: (B) 6 · Official NTA final key

Q10 JEE Main 2026 · 2 Apr · Shift 2 Numerical

The number of points in the interval $[2,4]$, at which the function $f(x)=\left[x^2-x-\frac{1}{2}\right]$, where $[\cdot]$ denotes the greatest integer function, is discontinuous, is _____.

Numerical value type: the answer is a number.

Answer: 10. · Official NTA final key

Q11 JEE Main 2026 · 28 Jan · Shift 1 MCQ

The value of

$$\lim_{x\to 0}\frac{\log_e\left(\sec(ex)\cdot\sec\left(e^2x\right)\cdot\ldots\cdot\sec\left(e^{10}x\right)\right)}{e^2-e^{2\cos x}}$$

is equal to

(A) $\frac{\left(e^{10}-1\right)}{2e^2\left(e^2-1\right)}$
(B) $\frac{\left(e^{20}-1\right)}{2e^2\left(e^2-1\right)}$
(C) $\frac{\left(e^{10}-1\right)}{2\left(e^2-1\right)}$
(D) $\frac{\left(e^{20}-1\right)}{2\left(e^2-1\right)}$

Answer: (D) $\frac{\left(e^{20}-1\right)}{2\left(e^2-1\right)}$ · Official NTA final key

Q12 JEE Main 2026 · 28 Jan · Shift 2 MCQ

Let $f(x)=\lim_{\theta\to 0}\left(\frac{\cos\pi x-x^{\left(\frac{2}{\theta}\right)}\sin(x-1)}{1+x^{\left(\frac{2}{\theta}\right)}(x-1)}\right)$, $x\in\mathbf{R}$. Consider the following two statements :

(I) $f(x)$ is discontinous at $x=1$.

(II) $f(x)$ is continous at $x=-1$.

Then,

(A) Only (I) is True
(B) Neither (I) nor (II) is True
(C) Both (I) and (II) are True
(D) Only (II) is True

Answer: (B) Neither (I) nor (II) is True · Official NTA final key

Q13 JEE Main 2026 · 24 Jan · Shift 1 MCQ

Let $\alpha, \beta \in \mathbb{R}$ be such that the function $f(x) = \begin{cases} 2\alpha(x^2-2)+2\beta x, & x<1 \\ (\alpha+3)x+(\alpha-\beta), & x \geq 1 \end{cases}$ be differentiable at all $x \in \mathbb{R}$. Then $34(\alpha+\beta)$ is equal to

(A) 48
(B) 84
(C) 24
(D) 36

Answer: (A) 48 · Official NTA final key

Q14 JEE Main 2026 · 24 Jan · Shift 1 MCQ

If the function $f(x) = \dfrac{e^x\left(e^{\tan x - x}-1\right)+\log_e(\sec x+\tan x)-x}{\tan x - x}$ is continuous at $x=0$, then the value of $f(0)$ is equal to

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

Answer: (B) $\frac{3}{2}$ · Official NTA final key

Q15 JEE Main 2026 · 24 Jan · Shift 2 MCQ

Let $[t]$ denote the greatest integer less than or equal to t. If the function

$$f(x) = \begin{cases} b^2 \sin\left(\frac{\pi}{2}\left[\frac{\pi}{2}(\cos x+\sin x)\cos x\right]\right), & x<0 \\ \dfrac{\sin x - \frac{1}{2}\sin 2x}{x^3}, & x>0 \\ a, & x=0 \end{cases}$$

is continuous at $x=0$, then a^2+b^2 is equal to

(A) $\frac{3}{4}$
(B) $\frac{1}{2}$
(C) $\frac{5}{8}$
(D) $\frac{9}{16}$

Answer: (A) $\frac{3}{4}$ · Official NTA final key

Q16 JEE Main 2026 · 23 Jan · Shift 1 MCQ

Let $f(x) = \begin{cases} \dfrac{ax^2 + 2ax + 3}{4x^2 + 4x - 3}, & x \neq -\dfrac{3}{2}, \dfrac{1}{2} \\ b, & x = -\dfrac{3}{2}, \dfrac{1}{2} \end{cases}$

be continuous at $x = -\dfrac{3}{2}$. If $f \circ f(x) = \dfrac{7}{5}$, then x is equal to :

(A) 0
(B) 2
(C) 1
(D) 1.4

Answer: (C) 1 · Official NTA final key

Q17 JEE Main 2026 · 23 Jan · Shift 2 MCQ

If $f(x) = \begin{cases} \dfrac{a|x| + x^2 - 2(\sin|x|)(\cos|x|)}{x}, & x \neq 0 \\ b, & x = 0 \end{cases}$ is continuous at $x = 0$, then $a + b$ is equal to

(A) 0
(B) 1
(C) 4
(D) 2

Answer: (D) 2 · Official NTA final key

Q18 JEE Main 2026 · 22 Jan · Shift 2 MCQ

Let $[\cdot]$ denote the greatest integer function, and let $f(x) = \min\{\sqrt{2}x, x^2\}$.

Let S $= \{x \in (-2, 2) :$ the function $g(x) = |x|[x^2]$ is discontinuous at $x\}$.

Then $\sum_{x \in S} f(x)$ equals

(A) $2-\sqrt{2}$
(B) $1-\sqrt{2}$
(C) $2\sqrt{6}-3\sqrt{2}$
(D) $\sqrt{6}-2\sqrt{2}$

Answer: (B) $1-\sqrt{2}$ · Official NTA final key

Q19 JEE Main 2026 · 22 Jan · Shift 2 MCQ

If $\lim\limits_{x\to 0}\dfrac{e^{(a-1)x}+2\cos bx+(c-2)e^{-x}}{x\cos x-\log_e(1+x)}=2$, then $a^2+b^2+c^2$ is equal to :

(A) 3
(B) 7
(C) 5
(D) 9

Answer: (B) 7 · Official NTA final key

Q20 JEE Main 2026 · 21 Jan · Shift 1 MCQ

Let $f:\mathbf{R}\to(0,\infty)$ be a twice differentiable function such that $f(3)=18$, $f'(3)=0$ and $f''(3)=4$. Then

$\lim_{x\to 1}\left(\log_e\left(\left(\dfrac{f(2+x)}{f(3)}\right)^{\frac{18}{(x-1)^2}}\right)\right)$ is equal to :

(A) 2
(B) 1
(C) 18
(D) 9

Answer: (A) 2 · Official NTA final key

Q21 JEE Main 2025 · 8 Apr · Shift 2 MCQ

Given below are two statements:

Statement I : $\lim_{x\to 0}\left(\dfrac{\tan^{-1}x+\log_e\sqrt{\frac{1+x}{1-x}}-2x}{x^5}\right)=\frac{2}{5}$

Statement II : $\lim_{x\to 1}\left(x^{\frac{2}{1-x}}\right)=\frac{1}{e^2}$

In the light of the above statements, choose the correct answer from the options given below

(A) Both Statement I and Statement II are true
(B) Statement I is false but Statement II is true
(C) Both Statement I and Statement II are false
(D) Statement I is true but Statement II is false

Answer: (A) Both Statement I and Statement II are true · Key from source paper

---

Q22 JEE Main 2025 · 7 Apr · Shift 1 MCQ

$\lim_{x\to 0^+} \frac{\tan\left(5(x)^{\frac{1}{3}}\right)\log_e\left(1+3x^2\right)}{\left(\tan^{-1}3\sqrt{x}\right)^2\left(e^{5(x)^{\frac{4}{3}}}-1\right)}$ is equal to

(A) $\frac{5}{3}$
(B) $\frac{1}{15}$
(C) 1
(D) $\frac{1}{3}$

Answer: (D) $\frac{1}{3}$ · Key from source paper

Q23 JEE Main 2025 · 7 Apr · Shift 1 Numerical

The number of points of discontinuity of the function $f(x)=\left[\frac{x^2}{2}\right]-[\sqrt{x}], x\in[0,4]$, where [·] denotes the greatest integer function, is _____ .

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q24 JEE Main 2025 · 7 Apr · Shift 2 Numerical

For $t>-1$, let α_t and β_t be the roots of the equation $\left((t+2)^{1/7}-1\right)x^2+\left((t+2)^{1/6}-1\right)x+\left((t+2)^{1/21}-1\right)=0$. If $\lim_{t\to-1^+}\alpha_t=a$ and $\lim_{t\to-1^+}\beta_t=b$ then $72(a+b)^2$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 98. · Key from source paper

Q25 JEE Main 2025 · 7 Apr · Shift 2 Numerical

If the function $f(x)=\frac{\tan(\tan x)-\sin(\sin x)}{\tan x-\sin x}$ is continuous at $x=0$, then $f(0)$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q26 JEE Main 2025 · 4 Apr · Shift 1 MCQ

If $\lim_{x\to1^+}\frac{(x-1)(6+\lambda\cos(x-1))+\mu\sin(1-x)}{(x-1)^3}=-1$, where $\lambda,\mu\in\mathbb{R}$, then $\lambda+\mu$ is equal to

(A) 18
(B) 19
(C) 17
(D) 20

Answer: (A) 18 · Key from source paper

Q27 JEE Main 2025 · 4 Apr · Shift 1 Numerical

Let m and n be the number of points at which the function $f(x) = \max\left\{x, x^3, x^5, \ldots, x^{21}\right\}, x \in \mathbb{R}$, is not differentiable and not continuous, respectively. Then $m + n$ is equal to _____

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q28 JEE Main 2025 · 4 Apr · Shift 2 MCQ

Let f be a differentiable function on $\mathbf{R}$ such that $f(2) = 1, f'(2) = 4$. Let $\lim_{x\to 0}(f(2+x))^{3/x} = \mathbf{e}^{\alpha}$. Then the number of times the curve $y = 4x^3 - 4x^2 - 4(\alpha - 7)x - \alpha$ meets x -axis is :

(A) 1
(B) 3
(C) 0
(D) 2

Answer: (D) 2 · Key from source paper

Q29 JEE Main 2025 · 3 Apr · Shift 1 MCQ

Let $f(x) = \begin{cases} (1+ax)^{1/x} & , x < 0 \\ 1+b & , x = 0 \\ \frac{(x+4)^{1/2}-2}{(x+c)^{1/3}-2} & , x > 0 \end{cases}$ be continuous at $x = 0$. Then $e^a bc$ is equal to:

(A) 72
(B) 48
(C) 36
(D) 64

Answer: (B) 48 · Key from source paper

Q30 JEE Main 2025 · 3 Apr · Shift 2 Numerical

If $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{\frac{1}{x^2}} = p$, then $96\log_e p$ is equal to _____

Numerical value type: the answer is a number.

Answer: 32. · Key from source paper

Q31 JEE Main 2025 · 2 Apr · Shift 1 MCQ

For $\alpha, \beta, \gamma \in R$, if $\lim_{x \to 0} \frac{x^2 \sin \alpha x + (\gamma - 1)e^{x^2}}{\sin 2x - \beta x} = 3$, then $\beta + \gamma - \alpha$ is equal to :

(A) 6
(B) -1
(C) 4
(D) 7

Answer: (D) 7 · Key from source paper

Q32 JEE Main 2025 · 2 Apr · Shift 2 MCQ

If $\lim_{x \to 0} \frac{\cos(2x) + a\cos(4x) - b}{x^4}$ is finite, then $(a + b)$ is equal to :

(A) -1
(B) 0
(C) $\frac{3}{4}$
(D) $\frac{1}{2}$

Answer: (D) $\frac{1}{2}$ · Key from source paper

Q33 JEE Main 2025 · 29 Jan · Shift 1 Numerical

Let [t] be the greatest integer less than or equal to t. Then the least value of $p \in \mathbf{N}$ for which $\lim_{x \to 0^+} \left(x\left(\left[\frac{1}{x}\right] + \left[\frac{2}{x}\right] + \ldots + \left[\frac{p}{x}\right]\right) - x^2\left(\left[\frac{1}{x^2}\right] + \left[\frac{2^2}{x^2}\right] + \ldots + \left[\frac{9^2}{x^2}\right]\right)\right) \geq 1$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 24. · Key from source paper

Q34 JEE Main 2025 · 29 Jan · Shift 2 MCQ

Let the function $f(x) = (x^2 + 1)\,|x^2 - ax + 2| + \cos|x|$ be not differentiable at the two points $x = \alpha = 2$ and $x = \beta$. Then the distance of the point (α, β) from the line $12x + 5y + 10 = 0$ is equal to :

(A) 5
(B) 4
(C) 3
(D) 2

Answer: (C) 3 · Key from source paper

Q35 JEE Main 2025 · 29 Jan · Shift 2 Numerical

If $\lim_{t \to 0} \left(\int_0^1 (3x + 5)^t dx\right)^{\frac{1}{t}} = \frac{\alpha}{5e}\left(\frac{8}{5}\right)^{\frac{2}{3}}$, then α is equal to _____

Numerical value type: the answer is a number.

Answer: 64. · Key from source paper

Q36 JEE Main 2025 · 28 Jan · Shift 1 Numerical

Let $\mathrm{f}(x)=\begin{cases}3x, & x<0\\ \min\{1+x+[x], x+2[x]\}, & 0\le x\le 2\\ 5, & x>2,\end{cases}$ where $[.]$ denotes greatest integer function. If α and β are the number of points, where f is not continuous and is not differentiable, respectively, then $\alpha+\beta$ equals _____ .

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q37 JEE Main 2025 · 28 Jan · Shift 2 Numerical

Let $f(x)=\lim_{n\to\infty}\sum_{r=0}^{n}\left(\frac{\tan\left(x/2^{r+1}\right)+\tan^3\left(x/2^{r+1}\right)}{1-\tan^2\left(x/2^{r+1}\right)}\right)$. Then $\lim_{x\to 0}\frac{e^x-e^{f(x)}}{(x-f(x))}$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q38 JEE Main 2025 · 24 Jan · Shift 1 MCQ

$\lim_{x\to 0}\operatorname{cosec} x\left(\sqrt{2\cos^2 x+3\cos x}-\sqrt{\cos^2 x+\sin x+4}\right)$ is:

(A) 0
(B) $\frac{1}{\sqrt{15}}$
(C) $\frac{1}{2\sqrt{5}}$
(D) $-\frac{1}{2\sqrt{5}}$

Answer: (D) $-\frac{1}{2\sqrt{5}}$ · Key from source paper

Q39 JEE Main 2025 · 24 Jan · Shift 2 MCQ

Let $[x]$ denote the greatest integer function, and let m and n respectively be the numbers of the points, where the function $f(x)=[x]+|x-2|$, $-2<x<3$, is not continuous and not differentiable. Then $\mathrm{m}+\mathrm{n}$ is equal to :

(A) 6
(B) 8
(C) 9
(D) 7

Answer: (B) 8 · Key from source paper

Q40 JEE Main 2025 · 23 Jan · Shift 1 MCQ

If the function $f(x)=\begin{cases}\frac{2}{x}\{\sin(k_1+1)x+\sin(k_2-1)x\}, & x<0\\ 4, & x=0\\ \frac{2}{x}\log_e\left(\frac{2+k_1x}{2+k_2x}\right), & x>0\end{cases}$ is continuous at $x=0$, then $k_1^2+k_2^2$ is equal to

(A) 20
(B) 5
(C) 8
(D) 10

Answer: (D) 10 · Key from source paper

Q41 JEE Main 2025 · 23 Jan · Shift 2 MCQ

$\lim_{x\to\infty}\frac{\left(2x^2-3x+5\right)(3x-1)^{\frac{x}{2}}}{(3x^2+5x+4)\sqrt{(3x+2)^x}}$ is equal to :

(A) $\frac{2}{\sqrt{3e}}$
(B) $\frac{2e}{\sqrt{3}}$
(C) $\frac{2}{3\sqrt{e}}$
(D) $\frac{2e}{3}$

Answer: (C) $\frac{2}{3\sqrt{e}}$ · Key from source paper

Q42 JEE Main 2025 · 22 Jan · Shift 2 MCQ

If $\lim_{x\to\infty}\left(\left(\frac{e}{1-e}\right)\left(\frac{1}{e}-\frac{x}{1+x}\right)\right)^x=\alpha$, then the value of $\frac{\log_e\alpha}{1+\log_e\alpha}$ equals :

(A) e^{-1}
(B) e^2
(C) e^{-2}
(D) e

Answer: (D) e · Key from source paper

Q43 JEE Main 2024 · 9 Apr · Shift 1 Numerical

Let $f:(0,\pi)\to\mathbf{R}$ be a function given by $f(x)=\begin{cases}\left(\frac{8}{7}\right)^{\frac{\tan 8x}{\tan 7x}}, & 0<x<\frac{\pi}{2}\\ a-8, & x=\frac{\pi}{2}\\ (1+|\cot x|)^{\frac{b}{a}|\tan x|}, & \frac{\pi}{2}<x<\pi\end{cases}$ where $a,b\in\mathbf{Z}$.

If f is continuous at $x=\frac{\pi}{2}$, then a^2+b^2 is equal to _____

Numerical value type: the answer is a number.

Answer: 81. · Key from source paper

Q44 JEE Main 2024 · 9 Apr · Shift 2 MCQ

$\lim_{x\to\frac{\pi}{2}}\left(\frac{\int_{x^3}^{(\pi/2)^3}\left(\sin\left(2t^{1/3}\right)+\cos\left(t^{1/3}\right)\right)dt}{\left(x-\frac{\pi}{2}\right)^2}\right)$ is equal to

(A) $\frac{5\pi^2}{9}$
(B) $\frac{9\pi^2}{8}$
(C) $\frac{11\pi^2}{10}$
(D) $\frac{3\pi^2}{2}$

Answer: (B) $\frac{9\pi^2}{8}$ · Key from source paper

Q45 JEE Main 2024 · 9 Apr · Shift 2 MCQ

$\lim_{x\to0}\frac{e-(1+2x)^{\frac{1}{2x}}}{x}$ is equal to

(A) 0
(B) $\frac{-2}{e}$
(C) e
(D) $e-e^2$

Answer: (C) e · Key from source paper

Q46 JEE Main 2024 · 8 Apr · Shift 1 Numerical

The value of $\lim_{x\to0}2\left(\frac{1-\cos x\sqrt{\cos 2x}\sqrt[3]{\cos 3x}\ldots\ldots\sqrt[10]{\cos 10x}}{x^2}\right)$ is

Numerical value type: the answer is a number.

Answer: 55. · Key from source paper

Q47 JEE Main 2024 · 8 Apr · Shift 2 MCQ

For $a,b>0$, let $f(x)=\begin{cases}\frac{\tan((a+1)x)+b\tan x}{x}, & x<0\\ 3, & x=0\\ \frac{\sqrt{ax+b^2x^2}-\sqrt{ax}}{b\sqrt{a}\,x\sqrt{x}}, & x>0\end{cases}$ be a continuous function at $x=0$. Then $\frac{b}{a}$ is equal to :

(A) 6
(B) 4
(C) 5
(D) 8

Answer: (A) 6 · Key from source paper

Q48 JEE Main 2024 · 8 Apr · Shift 2 · Numerical

If $\alpha = \lim_{x\to 0^+}\left(\frac{e^{\sqrt{\tan x}}-e^{\sqrt{x}}}{\sqrt{\tan x}-\sqrt{x}}\right)$ and $\beta = \lim_{x\to 0}(1+\sin x)^{\frac{1}{2}\cot x}$ are the roots of the quadratic equation $ax^2+bx-\sqrt{e}=0$, then $12\log_e(a+b)$ is equal to _____

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q49 JEE Main 2024 · 6 Apr · Shift 1 · MCQ

Let $f:(-\infty,\infty)-\{0\}\to\mathbb{R}$ be a differentiable function such that $f'(1)=\lim_{a\to\infty}a^2 f\left(\frac{1}{a}\right)$. Then $\lim_{a\to\infty}\frac{a(a+1)}{2}\tan^{-1}\left(\frac{1}{a}\right)+a^2-2\log_e a$ is equal to

(A) $\frac{3}{2}+\frac{\pi}{4}$
(B) $\frac{3}{4}+\frac{\pi}{8}$
(C) $\frac{3}{8}+\frac{\pi}{4}$
(D) $\frac{5}{2}+\frac{\pi}{8}$

Answer: (D) $\frac{5}{2}+\frac{\pi}{8}$ · Key from source paper

Q50 JEE Main 2024 · 6 Apr · Shift 2 · MCQ

$\lim_{n\to\infty}\frac{(1^2-1)(n-1)+(2^2-2)(n-2)+\cdots+((n-1)^2-(n-1))\cdot 1}{(1^3+2^3+\cdots\cdots+n^3)-(1^2+2^2+\cdots\cdots+n^2)}$ is equal to :

(A) $\frac{2}{3}$
(B) $\frac{1}{3}$
(C) $\frac{3}{4}$
(D) $\frac{1}{2}$

Answer: (B) $\frac{1}{3}$ · Key from source paper

Q51 JEE Main 2024 · 6 Apr · Shift 2 · Numerical

Let $[t]$ denote the greatest integer less than or equal to t. Let $f:[0,\infty)\to\mathbf{R}$ be a function defined by $f(x)=\left[\frac{x}{2}+3\right]-[\sqrt{x}]$. Let S be the set of all points in the interval $[0,8]$ at which f is not continuous. Then $\sum_{a\in S}a$ is equal to _____

Numerical value type: the answer is a number.

Answer: 17. · Key from source paper

Q52 JEE Main 2024 · 5 Apr · Shift 1 · MCQ

If the function $f(x)=\frac{\sin 3x+\alpha\sin x-\beta\cos 3x}{x^3}$, $x\in\mathbf{R}$, is continuous at $x=0$, then $f(0)$ is equal to :

(A) 2
(B) -2
(C) 4
(D) -4

Answer: (D) -4 · Key from source paper

Q53 JEE Main 2024 · 5 Apr · Shift 2 MCQ

Let $f:[-1,2]\to\mathbf{R}$ be given by $f(x)=2x^2+x+\left[x^2\right]-[x]$, where $[t]$ denotes the greatest integer less than or equal to t. The number of points, where f is not continuous, is :

(A) 5
(B) 6
(C) 3
(D) 4

Answer: (D) 4 · Key from source paper

Q54 JEE Main 2024 · 5 Apr · Shift 2 Numerical

Let $a>0$ be a root of the equation $2x^2+x-2=0$. If $\lim_{x\to\frac{1}{a}}\frac{16\left(1-\cos\left(2+x-2x^2\right)\right)}{(1-ax)^2}=\alpha+\beta\sqrt{17}$, where $\alpha,\beta\in Z$, then $\alpha+\beta$ is equal to _____

Numerical value type: the answer is a number.

Answer: 170. · Key from source paper

Q55 JEE Main 2024 · 4 Apr · Shift 1 MCQ

Let $f:\mathbf{R}\to\mathbf{R}$ be a function given by $f(x)=\begin{cases}\frac{1-\cos 2x}{x^2}, & x<0\\ \alpha, & x=0\\ \frac{\beta\sqrt{1-\cos x}}{x}, & x>0\end{cases}$, where $\alpha,\beta\in\mathbf{R}$. If f is continuous at $x=0$, then $\alpha^2+\beta^2$ is equal to :

(A) 3
(B) 12
(C) 48
(D) 6

Answer: (B) 12 · Key from source paper

Q56 JEE Main 2024 · 4 Apr · Shift 1 Numerical

If $\lim_{x\to1}\frac{(5x+1)^{1/3}-(x+5)^{1/3}}{(2x+3)^{1/2}-(x+4)^{1/2}}=\frac{\mathrm{m}\sqrt{5}}{\mathrm{n}(2\mathrm{n})^{2/3}}$, where $\gcd(\mathrm{m},\mathrm{n})=1$, then 8 m + 12n is equal to _____

Numerical value type: the answer is a number.

Answer: 100. · Key from source paper

Q57 JEE Main 2024 · 4 Apr · Shift 2 MCQ

Let $f(x)=\int_0^x(t+\sin(1-e^t))dt, x\in\mathbb{R}$. Then, $\lim_{x\to0}\frac{f(x)}{x^3}$ is equal to

(A) $-\frac{1}{6}$
(B) $\frac{2}{3}$
(C) $-\frac{2}{3}$
(D) $\frac{1}{6}$

Answer: (A) $-\frac{1}{6}$ · Key from source paper

Q58 JEE Main 2024 · 4 Apr · Shift 2 MCQ

If the function $f(x)=\begin{cases}\frac{72^x-9^x-8^x+1}{\sqrt{2}-\sqrt{1+\cos x}}, & x\neq0\\ a\log_e 2\log_e 3, & x=0\end{cases}$ is continuous at $x=0$, then the value of a^2 is equal to

(A) 968
(B) 1152
(C) 746
(D) 1250

Answer: (B) 1152 · Key from source paper

Q59 JEE Main 2024 · 1 Feb · Shift 1 MCQ

Let $f:R\to R$ be defined as

$$fx=\begin{cases}\frac{a-b\cos2x}{x^2}; & x<0\\ x^2+cx+2; & 0\le x\le1\\ 2x+1; & x>1\end{cases}$$

If f is continuous everywhere in R and m is the number of points where f is NOT differential then $m+a+b+c$ equals:

(A) 1
(B) 4
(C) 3
(D) 2

Answer: (D) 2 · Key from source paper

Q60 JEE Main 2024 · 1 Feb · Shift 1 Numerical

Let x denote the fractional part of x and $fx=\frac{\cos^{-1}1-x^2\sin^{-1}1-x}{x-x^3}, x\neq0$. If L and R respectively denotes the left hand limit and the right hand limit of fx at $x=0$, then $\frac{32}{\pi^2}L^2+R^2$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 18. · Key from source paper

EdLoop JEE

Q61 JEE Main 2024 · 1 Feb · Shift 2 MCQ

Let $fx = \begin{cases} x-1, & x \text{ is even}, \\ 2x, & x \text{ is odd}, \end{cases}$ $x \in N$. If for some $a \in N$, $fffa = 21$, then $\lim_{x \to a^-} \frac{x^3}{a} - \frac{x}{a}$, where t denotes the greatest integer less than or equal to t, is equal to:

(A) 121
(B) 144
(C) 169
(D) 225

Answer: (B) 144 · Key from source paper

Q62 JEE Main 2024 · 1 Feb · Shift 2 MCQ

Let $fx = 2x^2 + 5x$ - 3, $x \in R$. If m and n denote the number of points where f is not continuous and not differentiable respectively, then $m + n$ is equal to:

(A) 5
(B) 2
(C) 0
(D) 3

Answer: (D) 3 · Key from source paper

Q63 JEE Main 2024 · 31 Jan · Shift 1 MCQ

$\lim_{x \to 0} \frac{e^{2 \sin x} - 2 \sin x - 1}{x^2}$

(A) is equal to -1
(B) does not exist
(C) is equal to 1
(D) is equal to 2

Answer: (D) is equal to 2 · Key from source paper

Q64 JEE Main 2024 · 31 Jan · Shift 1 MCQ

Let $g(x)$ be a linear function and $f(x) = \begin{cases} g(x), & x \leq 0 \\ \left(\frac{1+x}{2+x}\right)^{\frac{1}{x}}, & x > 0 \end{cases}$, is continuous at $x = 0$. If $f'(1) = f(-1)$, then the value of $g(3)$ is

(A) $\frac{1}{3}\log_e \frac{4}{9e^{\frac{1}{3}}}$
(B) $\frac{1}{3}\log_e \frac{4}{9}+1$
(C) $\log_e \frac{4}{9}-1$
(D) $\log_e \frac{4}{9e^{\frac{1}{3}}}$

Answer: (D) $\log_e \frac{4}{9e^{\frac{1}{3}}}$ · Key from source paper

Q65 JEE Main 2024 · 31 Jan · Shift 2 MCQ

Let $f :\to R \to 0,\infty$ be strictly increasing function such that $\lim_{x\to\infty}\frac{f(7x)}{f(x)}=1$. Then, the value of $\lim_{x\to\infty}\frac{f(5x)}{f(x)}-1$ is equal to

(A) 4
(B) 0
(C) $\frac{7}{5}$
(D) 1

Answer: (B) 0 · Key from source paper

Q66 JEE Main 2024 · 31 Jan · Shift 2 MCQ

Consider the function $f:0,\infty\to R$ defined by $f(x)=e^{-\log_e x}$. If m and n be respectively the number of points at which f is not continuous and f is not differentiable, then $m+n$ is

(A) 0
(B) 3
(C) 1
(D) 2

Answer: (C) 1 · Key from source paper

Q67 JEE Main 2024 · 31 Jan · Shift 2 Numerical

If $\lim_{x\to 0}\frac{ax^2e^x-b\log_e(1+x)+cxe^{-x}}{x^2\sin x}=1$, then $16a^2+b^2+c^2$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 81. · Key from source paper

Q68 JEE Main 2024 · 30 Jan · Shift 1 MCQ

Let $f:\left[-\frac{\pi}{2},\frac{\pi}{2}\right]\to R$ be a differentiable function such that $f(0)=\frac{1}{2}$, If $\lim_{x\to 0}\frac{x\int_0^x f(t)\,dt}{e^{x^2}-1}=\alpha$, then $8\alpha^2$ is equal to :

(A) 16
(B) 2
(C) 1
(D) 4

Answer: (B) 2 · Key from source paper

Q69 JEE Main 2024 · 30 Jan · Shift 1 Numerical

If the function $f(x)=\begin{cases}\frac{1}{|x|}, & |x|\geq 2\\ ax^2+2b, & |x|<2\end{cases}$ is differentiable on R, then $48(a+b)$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 15. · Key from source paper

Q70 JEE Main 2024 · 30 Jan · Shift 2 MCQ

Let a and b be real constants such that the function f defined by $f(x)=\begin{cases}x^2+3x+a, & x\leq 1\\ bx+2, & x>1\end{cases}$ be differentiable on R. Then, the value of $\int_{-2}^{2} f(x)\,dx$ equals

(A) $\frac{15}{6}$
(B) $\frac{19}{6}$
(C) 21
(D) 17

Answer: (D) 17 · Key from source paper

Q71 JEE Main 2024 · 29 Jan · Shift 2 Numerical

Let the slope of the line $45x+5y+3=0$ be $27r_1+\frac{9r_2}{2}$ for some $r_1,\ r_2\in R$. Then $\lim_{x\to 3}\left(\int_3^x \frac{8t^2}{\frac{3r_2x}{2}-r_2x^2-r_1x^3-3x}\,dt\right)$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 12. · Key from source paper

Q72 JEE Main 2024 · 27 Jan · Shift 1 MCQ

If $a=\lim_{x\to 0}\frac{\sqrt{1+\sqrt{1+x^4}}-\sqrt{2}}{x^4}$ and $b=\lim_{x\to 0}\frac{\sin^2 x}{\sqrt{2}-\sqrt{1+\cos x}}$, then the value of ab^3 is :

(A) 36
(B) 32
(C) 25
(D) 30

Answer: (B) 32 · Key from source paper

Q73 JEE Main 2024 · 27 Jan · Shift 1 MCQ

Consider the function $f(x)=\begin{cases}\dfrac{a(7x-12-x^2)}{b|x^2-7x+12|} & ,x<3\\ 2^{\frac{\sin(x-3)}{x-[x]}} & ,x>3\\ b & ,x=3\end{cases}$, where [x] denotes the greatest integer less than or equal to x. If S denotes the set of all ordered pairs (a, b) such that $f(x)$ is continuous at x = 3, then the number of elements in S is :

(A) 2
(B) Infinitely many
(C) 4
(D) 1

Answer: (D) 1 · Key from source paper

Q74 JEE Main 2024 · 27 Jan · Shift 2 MCQ

If $\lim_{x\to 0}\frac{3+\alpha\sin x+\beta\cos x+\log_e(1-x)}{3\tan^2 x}=\frac{1}{3}$, then $2\alpha-\beta$ is equal to :

(A) 2
(B) 7
(C) 5
(D) 1

Answer: (C) 5 · Key from source paper

Q75 JEE Main 2024 · 27 Jan · Shift 2 MCQ

Consider the function f: $(0,2)\to R$ defined by $f(x)=\frac{x}{2}+\frac{2}{x}$ and the function $g(x)$ defined by $gx=\begin{cases}\min\{f(t)\}, & 0<t\le x \text{ and } 0<x\le 1\\ \frac{3}{2}+x, & 1<x<2\end{cases}$. Then :

(A) g is continuous but not differentiable at x = 1
(B) g is not continuous for all $x\in(0,2)$
(C) g is neither continuous nor differentiable at x = 1
(D) g is continuous and differentiable for all $x\in(0,2)$

Answer: (A) g is continuous but not differentiable at x = 1 · Key from source paper

Q76 JEE Main 2023 · 15 Apr · Shift 1 MCQ

Let $[x]$ denote the greatest integer function and $f(x)=\max\{1+x+[x],\ 2+x,\ x+2[x]\}$, $0\le x\le 2$. Let m be the number of points in $[0,2]$, 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

(A) 2
(B) 11
(C) 6
(D) 3

Answer: (D) 3 · Key from source paper

Q77 JEE Main 2023 · 13 Apr · Shift 2 MCQ

If $\lim_{x\to 0} \frac{e^{ax}-\cos(bx)-\frac{cxe^{-cx}}{2}}{1-\cos(2x)} = 17$, then $5a^2+b^2$ is equal to

(A) 64
(B) 72
(C) 68
(D) 76

Answer: (C) 68 · Key from source paper

Q78 JEE Main 2023 · 12 Apr · Shift 1 Numerical

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 _____.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q79 JEE Main 2023 · 11 Apr · Shift 1 MCQ

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

(A) continuous at $x = 0$, but not continuous at $x = 1$
(B) continuous at $x = 1$, but not continuous at $x = 0$
(C) continuous at $x = 0$ and $x = 1$
(D) not continuous at $x = 0$ and $x = 1$

Answer: (B) continuous at $x = 1$, but not continuous at $x = 0$ · Key from source paper

---

Q80 JEE Main 2023 · 11 Apr · Shift 2 MCQ

Let f and g be two functions defined as $f(x) = \begin{cases} x+1, & x<0 \\ |x-1|, & x\geq 0 \end{cases}$ and $g(x) = \begin{cases} x+1, & x<0 \\ 1, & x\geq 0 \end{cases}$. Then $(g\circ f)(x)$ is

(A) Continuous everywhere but not differentiable exactly at one point
(B) Continuous everywhere but not differentiable at $x = 1$
(C) Differentiable everywhere
(D) Not continuous at $x = 1$

Answer: (A) Continuous everywhere but not differentiable exactly at one point · Key from source paper

---

Q81 JEE Main 2023 · 10 Apr · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q82 JEE Main 2023 · 8 Apr · Shift 1 MCQ

$\lim_{x\to 0}\left(\left(\frac{1-\cos^2(3x)}{\cos^3(4x)}\right)\left(\frac{\sin^3(4x)}{(\log_e(2x+1))^5}\right)\right)$ is equal to

(A) 15
(B) 9
(C) 18
(D) 24

Answer: (C) 18 · Key from source paper

Q83 JEE Main 2023 · 8 Apr · Shift 2 MCQ

If $\alpha > \beta > 0$ are the roots of the equation $ax^2 + bx + 1 = 0$, and $\lim_{x\to\frac{1}{\alpha}}\left(\frac{1-\cos(x^2+bx+a)}{2(1-\alpha x)^2}\right)^{\frac{1}{2}} = \frac{1}{k}\left(\frac{1}{\beta} - \frac{1}{\alpha}\right)$, then k is equal to

(A) 2β
(B) α
(C) 2α
(D) β

Answer: (C) 2α · Key from source paper

Q84 JEE Main 2023 · 8 Apr · Shift 2 Numerical

Let k and m be positive real numbers such that the function $f(x) = \begin{cases} 3x^2 + k\sqrt{x+1}, & 0 < x < 1 \\ mx^2 + k^2, & x \ge 1 \end{cases}$ is differentiable for all $x > 0$. Then $\frac{8f'(8)}{f'\left(\frac{1}{8}\right)}$ is equal to

Numerical value type: the answer is a number.

Answer: 309. · Key from source paper

Q85 JEE Main 2023 · 6 Apr · Shift 1 · Numerical

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 _____ .

Numerical value type: the answer is a number.

Answer: 25. · Key from source paper

Q86 JEE Main 2023 · 6 Apr · Shift 2 · MCQ

$\lim_{n\to\infty}\left\{\left(2^{\frac{1}{2}}-2^{\frac{1}{3}}\right)\left(2^{\frac{1}{2}}-2^{\frac{1}{5}}\right)\ldots\left(2^{\frac{1}{2}}-2^{\frac{1}{2n+1}}\right)\right\}$ is equal to

(A) 1
(B) 0
(C) $\sqrt{2}$
(D) $\frac{1}{\sqrt{2}}$

Answer: (B) 0 · Key from source paper

Q87 JEE Main 2023 · 31 Jan · Shift 2 · MCQ

$\lim_{x\to\infty}\frac{\left(\sqrt{3x+1}+\sqrt{3x-1}\right)^6+\left(\sqrt{3x+1}-\sqrt{3x-1}\right)^6}{\left(x+\sqrt{x^2-1}\right)^6+\left(x-\sqrt{x^2-1}\right)^6}x^3$

(A) is equal to $\frac{27}{2}$
(B) is equal to 9
(C) does not exist
(D) is equal to 27

Answer: (D) is equal to 27 · Key from source paper

Q88 JEE Main 2023 · 30 Jan · Shift 1 · Numerical

$\lim_{x\to 0}\frac{48}{x^4}\int_0^x\frac{t^3}{t^6+1}dt$ is equal to

Numerical value type: the answer is a number.

Answer: 12. · Key from source paper

Q89 JEE Main 2023 · 30 Jan · Shift 2 · MCQ

Let f, g and h be the real valued functions defined on $\mathbb{R}$ as $f(x) = \begin{cases}\frac{x}{|x|}, & x \neq 0\\ 1, & x = 0\end{cases}$, $g(x) = \begin{cases}\frac{\sin(x+1)}{(x+1)}, & x \neq -1\\ 1, & x = -1\end{cases}$ and $h(x) = 2[x] - f(x)$, where $[x]$ is the greatest integer $\leq x$. Then the value of $\lim_{x\to 1} g(h(x-1))$ is

(A) 1

(B) $\sin(1)$

(C) -1

(D) 0

Answer: (A) 1 · Key from source paper

Q90 JEE Main 2023 · 29 Jan · Shift 1 MCQ

Let $x=2$ be a root of the equation $x^2+px+q=0$ and $f(x)=\begin{cases}\dfrac{1-\cos(x^2-4px+q^2+8q)}{(x-2p)^4}, & x\neq 2p\\ 0, & x=2p\end{cases}$. Then $\lim_{x\to 2p^+}[f(x)]$ where $[\cdot]$ denotes greatest integer function, is

(A) 2

(B) 1

(C) 0

(D) -1

Answer: (C) 0 · Key from source paper

Q91 JEE Main 2023 · 25 Jan · Shift 1 MCQ

The value of $\lim_{n\to\infty}\frac{1+2-3+4+5-6+\ldots+(3n-2)+(3n-1)-3n}{\sqrt{2n^4+4n+3}-\sqrt{n^4+5n+4}}$ is

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

(B) $3\left(\sqrt{2}+1\right)$

(C) $\frac{3}{2}\left(\sqrt{2}+1\right)$

(D) $\frac{3}{2\sqrt{2}}$

Answer: (C) $\frac{3}{2}\left(\sqrt{2}+1\right)$ · Key from source paper

---

Q92 JEE Main 2023 · 25 Jan · Shift 2 MCQ

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

(A) 11

(B) 8

(C) $2e^4+8$

(D) 10

Answer: (D) 10 · Key from source paper

Q93 JEE Main 2023 · 24 Jan · Shift 1 MCQ

$\lim_{t\to 0}\left(1^{\frac{1}{\sin^2 t}}+2^{\frac{1}{\sin^2 t}}+3^{\frac{1}{\sin^2 t}}+\cdots\cdots+n^{\frac{1}{\sin^2 t}}\right)^{\sin^2 t}$ is equal to

(A) n^2+n
(B) n
(C) $\frac{nn+1}{2}$
(D) n^2

Answer: (B) n · Key from source paper

Q94 JEE Main 2023 · 24 Jan · Shift 1 MCQ

Let $f(x)=\begin{cases}x^2\sin\frac{1}{x}; & x\neq 0\\ 0; & x=0\end{cases}$, then at $x=0$

(A) f is continuous but not differentiable
(B) f is continuous but f' is not continuous
(C) both f and f' are continuous
(D) f' is continuous but not differentiable

Answer: (B) f is continuous but f' is not continuous · Key from source paper

Q95 JEE Main 2023 · 24 Jan · Shift 2 MCQ

The set of values of a for which $\lim_{x\to a}([x-5]-[2x+2])=0$, where $[\zeta]$ denotes the greatest integer less than or equal to ζ is equal to

(A) $(-7.5,-6.5)$
(B) $(-7.5,-6.5]$
(C) $[-7.5,-6.5]$
(D) $[-7.5,-6.5)$

Answer: (A) $(-7.5,-6.5)$ · Key from source paper

Q96 JEE Main 2022 · 29 Jul · Shift 1 MCQ

If $\lim_{x\to 0}\frac{\alpha e^x+\beta e^{-x}+\gamma\sin x}{x\sin^2 x}=\frac{2}{3}$, where $\alpha,\beta,\gamma\in R$, then which of the following is NOT correct?

(A) $\alpha^2+\beta^2+\gamma^2=6$
(B) $\alpha\beta+\beta\gamma+\gamma\alpha+1=0$
(C) $\alpha\beta^2+\beta\gamma^2+\gamma\alpha^2+3=0$
(D) $\alpha^2-\beta^2+\gamma^2=4$

Answer: (C) $\alpha\beta^2+\beta\gamma^2+\gamma\alpha^2+3=0$ · Key from source paper

EdLoop JEE

Q97 JEE Main 2022 · 29 Jul · Shift 1 MCQ

The number of points, where the function $f : R \to R$, $f(x) = |x-1|\cos|x-2|\sin|x-1| + (x-3)|x^2-5x+4|$, is NOT differentiable, is

(A) 1
(B) 2
(C) 3
(D) 4

Answer: (B) 2 · Key from source paper

Q98 JEE Main 2022 · 29 Jul · Shift 2 MCQ

Let the function $fx = \begin{cases} \frac{\log_e 1+5x-\log_e 1+\alpha x}{x} & \text{if } x \neq 0 \\ 10 & \text{if } x = 0 \end{cases}$ be continuous at $x = 0$. Then α is equal to

(A) 10
(B) -10
(C) 5
(D) -5

Answer: (D) -5 · Key from source paper

Q99 JEE Main 2022 · 29 Jul · Shift 2 Numerical

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 _____.

Numerical value type: the answer is a number.

Answer: 79. · Key from source paper

Q100 JEE Main 2022 · 28 Jul · Shift 1 Numerical

$\lim_{x\to 0} \frac{x+2\cos x^3+2x+2\cos x^2+3\sin x+2\cos x}{x+2^3+2x+2^2+3\sin x+2}^{\frac{100}{x}}$ is equal to

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q101 JEE Main 2022 · 28 Jul · Shift 2 MCQ

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

(A) $R-\{-1\}$
(B) $R-\{-1,1\}$
(C) $R-\{1\}$
(D) $R-\{0\}$

Answer: (B) $R-\{-1,1\}$ · Key from source paper

Q102 JEE Main 2022 · 27 Jul · Shift 2 MCQ

If for $p \neq q \neq 0$, then function $f(x)=\frac{\sqrt[7]{p(729+x)}-3}{\sqrt[3]{729+qx}-9}$ is continuous at $x=0$, then

(A) $7pqf(0)-1=0$
(B) $63qf(0)-p^2=0$
(C) $21qf(0)-p^2=0$
(D) $7pq\ f(0)-9=0$

Answer: (B) $63qf(0)-p^2=0$ · Key from source paper

Q103 JEE Main 2022 · 26 Jul · Shift 1 MCQ

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:

(A) 1
(B) -1
(C) e
(D) 0

Answer: (A) 1 · Key from source paper

Q104 JEE Main 2022 · 26 Jul · Shift 1 MCQ

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:

(A) -10
(B) 10
(C) 8
(D) -8

Answer: (D) -8 · Key from source paper

Q105 JEE Main 2022 · 26 Jul · Shift 2 MCQ

Let $\beta=\lim_{x\to 0}\frac{\alpha x-e^{3x}-1}{\alpha x e^{3x}-1}$ for some $\alpha\in\mathbb{R}$. Then the value of $\alpha+\beta$ is:

(A) $\frac{14}{5}$
(B) $\frac{3}{2}$
(C) $\frac{5}{2}$
(D) $\frac{7}{2}$

Answer: (C) $\frac{5}{2}$ · Key from source paper

Q106 JEE Main 2022 · 25 Jul · Shift 1 MCQ

If $\lim_{n\to\infty}\left(\sqrt{n^2-n-1}+n\alpha+\beta\right)=0$ then $8(\alpha+\beta)$ is equal to

(A) 4
(B) -8
(C) -4
(D) 8

Answer: (C) -4 · Key from source paper

Q107 JEE Main 2022 · 25 Jul · Shift 1 Numerical

Let $f(x)=|4x^2-8x+5|$, if $8x^2-6x+1\geq 0$; $f(x)=[4x^2-8x+5]$, if $8x^2-6x+1<0$, where $[\alpha]$ denotes the greatest integer less than or equal to α.
Then the number of points in R where f is not differentiable is _____.

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q108 JEE Main 2022 · 25 Jul · Shift 2 MCQ

$\lim_{x\to\frac{\pi}{4}}\frac{8\sqrt{2}-(\cos x+\sin x)^7}{\sqrt{2}-\sqrt{2}\sin 2x}$ is equal to

(A) 14
(B) 7
(C) $14\sqrt{2}$
(D) $7\sqrt{2}$

Answer: (A) 14 · Key from source paper

Q109 JEE Main 2022 · 29 Jun · Shift 1 MCQ

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

(A) $\left(3, \frac{27}{4}\right)$
(B) $\left(3, \frac{23}{4}\right)$
(C) $\left(4, \frac{27}{4}\right)$
(D) $\left(4, \frac{23}{4}\right)$

Answer: (C) $\left(4, \frac{27}{4}\right)$ · Key from source paper

---

Q110 JEE Main 2022 · 29 Jun · Shift 2 MCQ

The value of $\lim_{x \to 1} \frac{(x^2-1)\sin^2(\pi x)}{x^4 - 2x^3 + 2x - 1}$ is equal to:

(A) $\frac{\pi^2}{6}$
(B) $\frac{\pi^2}{3}$
(C) $\frac{\pi^2}{2}$
(D) π^2

Answer: (D) π^2 · Key from source paper

Q111 JEE Main 2022 · 28 Jun · Shift 1 MCQ

Let $f : \mathbb{R} \to \mathbb{R}$ be defined as $f(x) = \begin{cases} [e^x], & x < 0 \\ ae^x + [x-1], & 0 \le x < 1 \\ b + [\sin(\pi x)], & 1 \le x < 2 \\ [e^{-x}] - c, & x \ge 2 \end{cases}$

where $a, b, c \in \mathbb{R}$ and $[t]$ denotes greatest integer less than or equal to t. Then, which of the following statements is true?

(A) There exists $a, b, c \in \mathbb{R}$ such that f is continuous of $\mathbb{R}$.
(B) If f is discontinuous at exactly one point, then $a + b + c = 1$
(C) If f is discontinuous at exactly one point, then $a + b + c \neq 1$.
(D) f is discontinuous at atleast two points, for any values of a, b and c.

Answer: (C) If f is discontinuous at exactly one point, then $a + b + c \neq 1$. · Key from source paper

---

Q112 JEE Main 2022 · 28 Jun · Shift 2 MCQ

Let $f, g : \mathbf{R} \to \mathbf{R}$ be functions defined by

$f(x) = \begin{cases} [x] & , x < 0 \\ |1 - x| & , x \ge 0 \end{cases}$ and

$g(x) = \begin{cases} e^x - x, & x < 0 \\ (x-1)^2 - 1, & x \ge 0 \end{cases}$

where $[x]$ denote the greatest integer less than or equal to x. Then, the function fog is discontinuous at exactly

(A) one point
(B) two points
(C) three points
(D) four points

Answer: (B) two points · Key from source paper

Q113 JEE Main 2022 · 28 Jun · Shift 2 Numerical

If $\lim_{x\to 1}\left(\frac{\sin\left(3x^2-4x+1\right)-x^2+1}{2x^3-7x^2+ax+b}\right)=-2$, then the value of $(a-b)$ is equal to

Numerical value type: the answer is a number.

Answer: 11. · Key from source paper

Q114 JEE Main 2022 · 27 Jun · Shift 1 MCQ

Let a be an integer such that $\lim_{x\to 7}\frac{18-[1-x]}{[x-3a]}$ exists, where $[t]$ is greatest integer $\leq t$. Then a is equal to

(A) -2
(B) 6
(C) -6
(D) -7

Answer: (C) -6 · Key from source paper

Q115 JEE Main 2022 · 27 Jun · Shift 2 Numerical

Let $[t]$ denote the greatest integer $\leq t$ and $\{t\}$ denote the fractional part of t. Then integral value of α for which the left hand limit of the function $f(x)=[1+x]+\frac{\alpha^{2[x]+\{x\}}+[x]-1}{2[x]+\{x\}}$ at $x=0$ is equal to $\alpha-\frac{4}{3}$ is _____

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q116 JEE Main 2022 · 26 Jun · Shift 1 MCQ

$\lim_{x\to\frac{1}{\sqrt{2}}}\frac{\sin(\cos^{-1}x)-x}{1-\tan(\cos^{-1}x)}$ is equal to

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

Answer: (B) $\frac{-1}{\sqrt{2}}$ · Key from source paper

Q117 JEE Main 2022 · 26 Jun · Shift 1 MCQ

$f, g : R \to R$ be two real valued function defined as $f(x) = \begin{cases} -|x+3|, & x < 0 \\ e^x, & x \geq 0 \end{cases}$ and $g(x) = \begin{cases} x^2 + k_1 x, & x < 0 \\ 4x + k_2, & x \geq 0 \end{cases}$, where k_1 and k_2 are real constants. If $g \circ f$ is differentiable at $x = 0$, then $g \circ f(-4) + g \circ f(4)$ is equal to

(A) $4(e^4 + 1)$
(B) $2(2e^4 + 1)$
(C) $4e^4$
(D) $2(2e^4 - 1)$

Answer: (D) $2(2e^4 - 1)$ · Key from source paper

Q118 JEE Main 2022 · 26 Jun · Shift 2 MCQ

$\lim_{x \to 0} \frac{\cos(\sin x) - \cos x}{x^4}$ is equal to

(A) $\frac{1}{3}$
(B) $\frac{1}{6}$
(C) $\frac{1}{4}$
(D) $\frac{1}{12}$

Answer: (B) $\frac{1}{6}$ · Key from source paper

Q119 JEE Main 2022 · 26 Jun · Shift 2 MCQ

Let $f(x) = \min\{1, 1 + x \sin x\}, 0 \leq x \leq 2\pi$. If m is the number of points, where f is not differentiable and n is the number of points, where f is not continuous, then the ordered pair (m, n) is equal to

(A) $(2, 0)$
(B) $(1, 0)$
(C) $(1, 1)$
(D) $(2, 1)$

Answer: (B) $(1, 0)$ · Key from source paper

EdLoop JEE

Q120 JEE Main 2022 · 25 Jun · Shift 2 MCQ

$\lim_{x\to\frac{\pi}{2}} \tan^2 x\, 2\sin^2 x + 3\sin x + 4^{\frac{1}{2}} - \sin^2 x + 6\sin x + 2^{\frac{1}{2}}$ is equal to

(A) $\frac{1}{12}$
(B) $-\frac{1}{18}$
(C) $-\frac{1}{12}$
(D) $\frac{1}{6}$

Answer: (A) $\frac{1}{12}$ · Key from source paper

Q121 JEE Main 2022 · 25 Jun · Shift 2 Numerical

Let $fx = 2x^2 + 1$ and $gx = \begin{cases} 2x - 3, & x < 0 \\ 2x + 3, & x \geq 0 \end{cases}$, 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 _____ .

Numerical value type: the answer is a number.

Answer: 62. · Key from source paper

Q122 JEE Main 2022 · 24 Jun · Shift 1 Numerical

$$f(x) = \begin{cases} |2x^2 - 3x - 7| & \text{if } x \leq -1 \\ [4x^2 - 1] & \text{if } -1 < x < 1 \\ |x+1| + |x-2| & \text{if } x \geq 1 \end{cases}$$

The number of points where the function $f(x)$ is discontinuous is _____ where $[t]$ denotes the greatest integer $\leq t$.

Numerical value type: the answer is a number.

Answer: 7. · Key from source paper

Q123 JEE Main 2022 · 24 Jun · Shift 2 MCQ

Let $f(x) = \begin{cases} \frac{\sin(x-[x])}{x-[x]}, & x \in (-2,-1) \\ \max(2x, 3[|x|]), & |x| < 1 \\ 1, & \text{otherwise} \end{cases}$

where $[t]$ denotes greatest integer $\leq t$. If m is the number of points where f is not continuous and n is the number of points where f is not differentiable, the ordered pair (m, n) is:

(A) $(3, 3)$
(B) $(2, 4)$
(C) $(2, 3)$
(D) $(3, 4)$

Answer: (C) $(2, 3)$ · Key from source paper

Q124 JEE Main 2021 · 1 Sep · Shift 2 Numerical

Let $f(x)=x^6+2x^4+x^3+2x+3$, $x\in\mathrm{R}$. Then the natural number n for which $\lim_{x\to1}\frac{x^nf(1)-f(x)}{x-1}=44$ is _____.

Numerical value type: the answer is a number.

Answer: 7. · Key from source paper

Q125 JEE Main 2021 · 1 Sep · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q126 JEE Main 2021 · 31 Aug · Shift 1 MCQ

$\lim_{x\to0}\frac{\sin^2(\pi\cos^4x)}{x^4}$ is equal to :

(A) $2\pi^2$

(B) π^2

(C) $4\pi^2$

(D) 4π

Answer: (C) $4\pi^2$ · Key from source paper

Q127 JEE Main 2021 · 31 Aug · Shift 1 MCQ

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

(A) Four points

(B) Two points

(C) three points

(D) one point

Answer: (B) Two points · Key from source paper

Q128 JEE Main 2021 · 31 Aug · Shift 1 MCQ

If the function $f(x)=\begin{cases}\frac{1}{x}\log_e\left(\frac{1+\frac{x}{a}}{1-\frac{x}{b}}\right), & x<0\\ k, & x=0\\ \frac{\cos^2x-\sin^2x-1}{\sqrt{x^2+1}-1}, & x>0\end{cases}$

is continuous at $x=0$, then $\frac{1}{a}+\frac{1}{b}+\frac{4}{k}$ is equal to :

(A) 4
(B) 5
(C) -4
(D) -5

Answer: (D) -5 · Key from source paper

Q129 JEE Main 2021 · 31 Aug · Shift 2 MCQ

If $\alpha = \lim_{x\to\pi/4} \frac{\tan^3 x - \tan x}{\cos\left(x+\frac{\pi}{4}\right)}$ and $\beta = \lim_{x\to 0} \cos x^{\cot x}$ are the roots of the equation, $ax^2 + bx - 4 = 0$, then the ordered pair a, b is :

(A) $-1, 3$
(B) $1, -3$
(C) $1, 3$
(D) $-1, -3$

Answer: (C) $1, 3$ · Key from source paper

Q130 JEE Main 2021 · 27 Aug · Shift 1 MCQ

If α, β are the distinct roots of $x^2 + bx + c = 0$, then $\lim_{x\to\beta} \frac{e^{2(x^2+bx+c)} - 1 - 2(x^2+bx+c)}{(x-\beta)^2}$ is equal to

(A) $2(b^2 + 4c)$
(B) $b^2 - 4c$
(C) $2(b^2 - 4c)$
(D) $b^2 + 4c$

Answer: (C) $2(b^2 - 4c)$ · Key from source paper

Q131 JEE Main 2021 · 27 Aug · Shift 2 MCQ

If $\lim_{x\to\infty} \left(\sqrt{x^2 - x + 1} - ax\right) = b$, then the ordered pair $(a,\ b)$ is:

(A) $\left(1, -\frac{1}{2}\right)$
(B) $\left(-1, \frac{1}{2}\right)$
(C) $\left(-1, -\frac{1}{2}\right)$
(D) $\left(1, \frac{1}{2}\right)$

Answer: (A) $\left(1, -\frac{1}{2}\right)$ · Key from source paper

---

Q132 JEE Main 2021 · 26 Aug · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 14. · Key from source paper

Q133 JEE Main 2021 · 26 Aug · Shift 2 MCQ

Let $[t]$ denote the greatest integer less than or equal to t.
Let $f(x) = x - [x]$, $g(x) = 1 - x + [x]$, and $h(x) = \min\{f(x), g(x)\}$, $x \in [-2, 2]$. Then h is :

(A) continuous in $[-2, 2]$ but not differentiable at more than four points in $(-2, 2)$
(B) Continous in $[-2, 2]$ but not differentiable at exactly three poionts in $(-2, 2)$
(C) not continuous at exactly four points in $[-2, 2]$
(D) not continuous at exactly three points in $[-2, 2]$

Answer: (A) continuous in $[-2, 2]$ but not differentiable at more than four points in $(-2, 2)$ · Key from source paper

Q134 JEE Main 2021 · 27 Jul · Shift 1 MCQ

Let $f : R \to R$ be a function such that $f(2) = 4$ and $f'(2) = 1$. Then, the value of $\lim_{x \to 2} \frac{x^2 f(2) - 4f(x)}{x - 2}$ is equal to:

(A) 4
(B) 8
(C) 16
(D) 12

Answer: (D) 12 · Key from source paper

Q135 JEE Main 2021 · 27 Jul · Shift 1 MCQ

Let $f : \left(-\frac{\pi}{4}, \frac{\pi}{4}\right) \to R$ be defined as, $f(x) = \begin{cases} (1 + |\sin x|)^{\frac{3a}{|\sin x|}}, & -\frac{\pi}{4} < x < 0 \\ b, & x = 0 \\ e^{\cot 4x / \cot 2x}, & 0 < x < \frac{\pi}{4} \end{cases}$

If f is continuous at $x = 0$ then the value of $6a + b^2$ is equal to:

(A) $1 - e$
(B) $e - 1$
(C) $1 + e$
(D) e

Answer: (C) $1 + e$ · Key from source paper

Q136 JEE Main 2021 · 27 Jul · Shift 1 Numerical

Let $f : [0, 3] \to R$ be defined by $f(x) = \min\{x - [x], 1 + [x] - x\}$ where $[x]$ is the greatest integer less than or equal to x. Let P denote the set containing all $x \in [0, 3]$ where f is discontinuous, and Q

denote the set containing all $x \in (0,3)$ where f is not differentiable. Then the sum of number of elements in P and Q is equal to _____.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q137 JEE Main 2021 · 27 Jul · Shift 2 MCQ

The value of $\lim_{x\to 0}\left(\frac{x}{\sqrt[8]{1-\sin x}-\sqrt[8]{1+\sin x}}\right)$ is equal to :

(A) 0
(B) 4
(C) -4
(D) -1

Answer: (C) -4 · Key from source paper

Q138 JEE Main 2021 · 27 Jul · Shift 2 MCQ

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

(A) f is continuous everywhere but not differentiable exactly at one point in $(0,\infty)$
(B) f is differentiable everywhere in $(0,\infty)$
(C) f is not continuous exactly at two points in $(0,\infty)$
(D) f is continuous everywhere but not differentiable exactly at two points in $(0,\infty)$

Answer: (B) f **is differentiable everywhere in** $(0,\infty)$ · Key from source paper

---

Q139 JEE Main 2021 · 25 Jul · Shift 1 MCQ

Let $f:R\to R$ be defined as

$$fx=\begin{cases}\frac{\lambda x^2-5x+6}{\mu 5x-x^2-6} & x<2\\ e^{\frac{\tan(x-2)}{x-[x]}} & x>2\\ \mu & x=2\end{cases}$$

where x is the greatest integer less than or equal to x. If f is continuous at $x=2$, then $\lambda+\mu$ is equal to :

(A) $e(-e+1)$
(B) $e(e-2)$
(C) 1
(D) $2e-1$

Answer: (A) $e(-e+1)$ · Key from source paper

Q140 JEE Main 2021 · 25 Jul · Shift 1 MCQ

Let $f:[0,\infty)\to[0,\infty)$ be defined as $f(x)=\int_0^x[y]\,dy$ where $[x]$ is the greatest integer less than or equal to x. Which of the following is true?

(A) f is continuous at every point in $[0,\infty)$ and differentiable except at the integer points.
(B) f is both continuous and differentiable except at the integer points in $[0,\infty)$.
(C) f is continuous everywhere except at the integer points in $[0,\infty)$.
(D) f is differentiable at every point in $[0,\infty)$.

Answer: (A) f **is continuous at every point in** $[0,\infty)$ **and differentiable except at the integer points.** · Key from source paper

Q141 JEE Main 2021 · 25 Jul · Shift 2 MCQ

If $f(x)=\begin{cases}\int_0^x(5+|1-t|)dt, & x>2\\ 5x+1, & x\le 2\end{cases}$, then

(A) $f(x)$ is not continuous at $x=2$
(B) $f(x)$ is everywhere differentiable
(C) $f(x)$ is continuous but not differentiable at $x=2$
(D) $f(x)$ is not differentiable at $x=1$

Answer: (C) $f(x)$ **is continuous but not differentiable at** $x=2$ · Key from source paper

Q142 JEE Main 2021 · 25 Jul · Shift 2 Numerical

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 _____.

Numerical value type: the answer is a number.

Answer: 39. · Key from source paper

Q143 JEE Main 2021 · 22 Jul · Shift 1 MCQ

Let $f:R\to R$ be defined as $f(x)=\begin{cases}\frac{x^3}{(1-\cos 2x)^2}\log_e\left(\frac{1+2xe^{-2x}}{(1-xe^{-x})^2}\right) & ,\ x\neq 0\\ \alpha & ,\ x=0\end{cases}$

If f is continuous at $x=0$, then α is equal to:

(A) 1
(B) 3
(C) 0
(D) 2

Answer: (A) 1 · Key from source paper

Q144 JEE Main 2021 · 22 Jul · Shift 1 Numerical

Let $f : R \to R$ be a function defined as $f(x) = \begin{cases} 3\left(1 - \frac{|x|}{2}\right) & \text{if } |x| \leq 2 \\ 0 & \text{if } |x| > 2 \end{cases}$

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 _____.

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q145 JEE Main 2021 · 20 Jul · Shift 1 MCQ

Let a function $f : R \to R$ be defined as, $f(x) = \begin{cases} \sin x - e^x & \text{if } x \leq 0 \\ a + [-x] & \text{if } 0 < x < 1 \\ 2x - b & \text{if } x \geq 1 \end{cases}$

Where $[x]$ is the greatest integer less than or equal to x. If f is continuous on R, then $(a + b)$ is equal to:

(A) 4
(B) 3
(C) 2
(D) 5

Answer: (B) 3 · Key from source paper

Q146 JEE Main 2021 · 20 Jul · Shift 1 Numerical

If the value of $\lim_{x \to 0} \left(2 - \cos x \sqrt{\cos 2x}\right)^{\left(\frac{x+2}{x^2}\right)}$ is equal to e^a, then a is equal to _____.

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q147 JEE Main 2021 · 20 Jul · Shift 2 Numerical

If $\lim_{x \to 0} \left[\frac{\alpha x e^x - \beta \log_e(1+x) + \gamma x^2 e^{-x}}{x \sin^2 x}\right] = 10$, $\alpha, \beta, \gamma \in R$, then the value of $\alpha + \beta + \gamma$ is _____ .

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q148 JEE Main 2021 · 20 Jul · Shift 2 Numerical

Let a function $g : [0, 4] \to R$ be defined as

$g(x) = \begin{cases} \max_{0 \leq t \leq x} \left\{t^3 - 6t^2 + 9t - 3\right\}, & 0 \leq x \leq 3 \\ 4 - x, & 3 < x \leq 4 \end{cases}$

then the number of points in the interval $(0, 4)$ where $g(x)$ is NOT differentiable, is _____ .

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q149 JEE Main 2021 · 18 Mar · Shift 1 MCQ

If $\lim_{x\to 0}\frac{\sin^{-1}x-\tan^{-1}x}{3x^3}$ is equal to L, then the value of $(6L+1)$ is

(A) $\frac{1}{6}$
(B) $\frac{1}{2}$
(C) 6
(D) 2

Answer: (D) 2 · Key from source paper

Q150 JEE Main 2021 · 18 Mar · Shift 1 MCQ

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:

(A) $\frac{1}{2},\frac{1}{2}$
(B) $\frac{1}{2},-\frac{3}{2}$
(C) $\frac{5}{2},-\frac{3}{2}$
(D) $-\frac{1}{2},\frac{3}{2}$

Answer: (D) $-\frac{1}{2},\frac{3}{2}$ · Key from source paper

Q151 JEE Main 2021 · 18 Mar · Shift 2 MCQ

Let $f:R\to R$ be a function defined as

$$f(x)=\begin{cases}\frac{\sin(a+1)x+\sin 2x}{2x} & ,\text{if } x<0\\ b & ,\text{if } x=0\\ \frac{\sqrt{x+bx^3}-\sqrt{x}}{bx^{5/2}} & ,\text{if } x>0\end{cases}$$

If f is continuous at $x=0$, then the value of $a+b$ is equal to :

(A) $-\frac{5}{2}$
(B) -2
(C) -3
(D) $-\frac{3}{2}$

Answer: (D) $-\frac{3}{2}$ · Key from source paper

Q152 JEE Main 2021 · 18 Mar · Shift 2 Numerical

Let $f:R\to R$ satisfy the equation $f(x+y)=f(x)\cdot f(y)$ for all $x,y\in R$ and $f(x)\neq 0$ for any $x\in R$. If the function f is differentiable at $x=0$ and $f'(0)=3$, then $\lim_{h\to 0}\frac{1}{h}(f(h)-1)$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q153 JEE Main 2021 · 17 Mar · Shift 1 MCQ

The value of $\lim_{x\to 0^+} \frac{\cos^{-1}\left(x-[x]^2\right)\cdot\sin^{-1}\left(x-[x]^2\right)}{x-x^3}$, where $[x]$ denotes the greatest integer $\leq x$ is:

(A) π

(B) 0

(C) $\frac{\pi}{4}$

(D) $\frac{\pi}{2}$

Answer: (D) $\frac{\pi}{2}$ · Key from source paper

Q154 JEE Main 2021 · 17 Mar · Shift 1 Numerical

If the function $f(x)=\frac{\cos(\sin x)-\cos x}{x^4}$ is continuous at each point in its domain and $f(0)=\frac{1}{k}$, then k is _____.

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q155 JEE Main 2021 · 17 Mar · Shift 2 MCQ

The value of $\lim_{n\to\infty} \frac{[r]+[2r]+\ldots+[nr]}{n^2}$, where r is non-zero real number and $[r]$ denotes the greatest integer less than or equal to r, is equal to :

(A) $\frac{r}{2}$

(B) r

(C) $2r$

(D) 0

Answer: (A) $\frac{r}{2}$ · Key from source paper

Q156 JEE Main 2021 · 17 Mar · Shift 2 MCQ

The value of the limit $\lim_{\theta\to 0} \frac{\tan\left(\pi\cos^2\theta\right)}{\sin(2\pi\sin^2\theta)}$ is equal to :

(A) $-\frac{1}{2}$

(B) $-\frac{1}{4}$

(C) 0

(D) $\frac{1}{4}$

Answer: (A) $-\frac{1}{2}$ · Key from source paper

Q157 JEE Main 2021 · 16 Mar · Shift 1 MCQ

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 :

(A) 3

(B) 1

(C) 0

(D) 2

Answer: (B) 1 · Key from source paper

Q158 JEE Main 2021 · 16 Mar · Shift 1 Numerical

If $\lim_{x\to 0} \frac{ae^x - b\cos x + ce^{-x}}{x \sin x} = 2$, then $a+b+c$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q159 JEE Main 2021 · 16 Mar · Shift 2 MCQ

Let $\alpha \in R$ be such that the function $f(x) = \begin{cases} \frac{\cos^{-1}\left(1-\{x\}^2\right)\sin^{-1}(1-\{x\})}{\{x\}-\{x\}^3}, & x \neq 0 \\ \alpha, & x = 0 \end{cases}$ is continuous at $x = 0$, where $\{x\} = x - [x]$, $[x]$ is the greatest integer less than or equal to x. Then :

(A) $\alpha = \frac{\pi}{\sqrt{2}}$

(B) $\alpha = 0$

(C) no such α exists

(D) $\alpha = \frac{\pi}{4}$

Answer: (C) no such α exists · Key from source paper

Q160 JEE Main 2021 · 16 Mar · Shift 2 Numerical

Let $f : R \to R$ and $g : R \to R$ be defined as $f(x) = \begin{cases} x+a, & x<0 \\ |x-1|, & x \geq 0 \end{cases}$ and $g(x) = \begin{cases} x+1, & x<0 \\ (x-1)^2+b, & x \geq 0 \end{cases}$, where a, b are non-negative real numbers. If $g \circ f(x)$ is continuous for all $x \in R$, then $a+b$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q161 JEE Main 2021 · 26 Feb · Shift 1 MCQ

The value of $\lim_{h\to 0}\left\{\frac{\sqrt{3}\sin\left(\frac{\pi}{6}+h\right)-\cos\left(\frac{\pi}{6}+h\right)}{\sqrt{3}h\left(\sqrt{3}\cos h-\sin h\right)}\right\}$ is :

(A) $\frac{4}{3}$
(B) $\frac{2}{\sqrt{3}}$
(C) $\frac{2}{3}$
(D) $\frac{3}{4}$

Answer: (C) $\frac{2}{3}$ · Key from source paper

Q162 JEE Main 2021 · 26 Feb · Shift 1 MCQ

Let f be any function defined on R and let it satisfy the condition: $|f(x)-f(y)| \leq \left|(x-y)^2\right|, \forall (x,y)\in R$. If $f(0)=1$, then :

(A) $f(x)=0, \forall x\in R$
(B) $f(x)$ can take any value in R
(C) $f(x)<0, \forall x\in R$
(D) $f(x)>0, \forall x\in R$

Answer: (D) $f(x)>0, \forall x\in R$ · Key from source paper

Q163 JEE Main 2021 · 26 Feb · Shift 2 MCQ

Let $f(x)$ be a differentiable function at $x=a$ with $f'(a)=2$ and $f(a)=4$. Then $\lim_{x\to a}\frac{xf(a)-af(x)}{x-a}$ equals:

(A) $a+4$
(B) $2a-4$
(C) $4-2a$
(D) $2a+4$

Answer: (C) $4-2a$ · Key from source paper

Q164 JEE Main 2021 · 26 Feb · Shift 2 MCQ

Let $f: R\to R$ be defined as $f(x)=\begin{cases}2\sin\left(-\frac{\pi x}{2}\right), & \text{if } x<-1\\ |ax^2+x+b|, & \text{if } -1\leq x\leq 1\\ \sin(\pi x), & \text{if } x>1\end{cases}$

If $f(x)$ is continuous on R, then $a+b$ equals :

(A) 1
(B) 3
(C) -3
(D) -1

Answer: (D) -1 · Key from source paper

Q165 JEE Main 2021 · 25 Feb · Shift 1 MCQ

$\lim_{n\to\infty}\left(1+\frac{1+\frac{1}{2}+\ldots\ldots+\frac{1}{n}}{n^2}\right)^n$ is equal to

(A) $\frac{1}{e}$
(B) 0
(C) $\frac{1}{2}$
(D) 1

Answer: (D) 1 · Key from source paper

Q166 JEE Main 2021 · 25 Feb · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q167 JEE Main 2021 · 25 Feb · Shift 2 Numerical

If $\lim_{x\to 0}\frac{ax-(e^{4x}-1)}{ax(e^{4x}-1)}$ exists and is equal to b, then the value of $a-2b$ is _____.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q168 JEE Main 2021 · 25 Feb · Shift 2 Numerical

A function f is defined on $[-3,3]$ as

$$f(x)=\begin{cases}\min\{|x|,2-x^2\}, & -2\le x\le 2\\ [|x|], & 2<|x|\le 3\end{cases}$$

where $[x]$ denotes the greatest integer $\le x$. The number of points, where f is not differentiable in $(-3,3)$ is _____.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q169 JEE Main 2021 · 24 Feb · Shift 1 MCQ

If $f : R \to R$ is a function defined by $fx = x - 1 \cos \frac{2x-1}{2}\pi$, where · denotes the greatest integer function, then f is:

(A) discontinuous only at $x = 1$
(B) discontinuous at all integral values of x except at $x = 1$
(C) continuous only at $x = 1$
(D) continuous for every real x

Answer: (D) continuous for every real x · Key from source paper

Q170 JEE Main 2021 · 24 Feb · Shift 1 MCQ

$\lim_{x\to 0} \frac{\int_0^{x^2} \sin\sqrt{t}\, dt}{x^3}$ is equal to:

(A) 0
(B) $\frac{2}{3}$
(C) $\frac{3}{2}$
(D) $\frac{1}{15}$

Answer: (B) $\frac{2}{3}$ · Key from source paper

Q171 JEE Main 2020 · 6 Sep · Shift 1 MCQ

$\lim_{x\to 1} \left(\frac{\int_0^{(x-1)^2} t\cos t^2 \mathrm{dt}}{(x-1)\sin(x-1)} \right)$

(A) is equal to $\frac{1}{2}$.
(B) is equal to 1.
(C) is equal to $-\frac{1}{2}$.
(D) is equal to 0.

Answer: (D) is equal to 0. · Key from source paper

Q172 JEE Main 2020 · 6 Sep · Shift 1 Numerical

Let $f : R \to R$ be defined as $f(x) = \begin{cases} x^5 \sin\left(\frac{1}{x}\right) + 5x^2 & , x < 0 \\ 0 & , x = 0 \\ x^5 \cos\left(\frac{1}{x}\right) + \lambda x^2 & , x > 0 \end{cases}$. The value of λ for which $f''(0)$ exists, is _____.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q173 JEE Main 2020 · 6 Sep · Shift 2 MCQ

Let $f : R \to R$ be a function defined by $f(x) = \max\{x, x^2\}$.Let S denote the set of all points in R ,where f is not differentiable.Then :

(A) $\{0, 1\}$
(B) $\{0\}$
(C) ϕ (an empty set)
(D) $\{1\}$

Answer: (A) $\{0, 1\}$ · Key from source paper

Q174 JEE Main 2020 · 5 Sep · Shift 1 MCQ

If α is the positive root of the equation, $p(x) = x^2 - x - 2 = 0$, then $\lim_{x \to \alpha^+} \frac{\sqrt{1-\cos p(x)}}{x+\alpha-4}$ is equal to

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

Answer: (B) $\frac{3}{\sqrt{2}}$ · Key from source paper

Q175 JEE Main 2020 · 5 Sep · Shift 1 MCQ

If the function $f(x) = \begin{cases} k_1(x-\pi)^2 - 1, & x \le \pi \\ k_2 \cos x, & x > \pi \end{cases}$ is twice differentiable, then the ordered pair (k_1, k_2) is equal to:

(A) $\left(\frac{1}{2}, 1\right)$
(B) $(1, 0)$
(C) $\left(\frac{1}{2}, -1\right)$
(D) $(1, 1)$

Answer: (A) $\left(\frac{1}{2}, 1\right)$ · Key from source paper

Q176 JEE Main 2020 · 5 Sep · Shift 1 Numerical

Let $f(x) = x \cdot \left[\frac{x}{2}\right]$, for $-10 < x < 10$, where $[t]$ denotes the greatest integer function. Then the number of points of discontinuity of $f(x)$ is equal to

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q177 JEE Main 2020 · 5 Sep · Shift 2 MCQ

$\lim_{x \to 0} \frac{x\left(e^{\left(\sqrt{1+x^2+x^4}-1\right)/x}-1\right)}{\sqrt{1+x^2+x^4}-1}$

(A) is equal to $\sqrt{e}$
(B) is equal to 1
(C) is equal to 0
(D) does not exist

Answer: (B) is equal to 1 · Key from source paper

Q178 JEE Main 2020 · 4 Sep · Shift 1 Numerical

Suppose a differentiable function $f(x)$ satisfies the identity $f(x+y)=f(x)+f(y)+xy^2+x^2y$, for all real x and y. If $\lim_{x\to 0}\frac{f(x)}{x}=1$, then $f'(3)$ is equal to :

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q179 JEE Main 2020 · 4 Sep · Shift 2 MCQ

The function $f(x)=\begin{cases}\frac{\pi}{4}+\tan^{-1}x, & |x|\le 1\\ \frac{1}{2}(|x|-1), & |x|>1\end{cases}$ is :

(A) continuous on $R-\{1\}$ and differentiable on $R-\{-1,1\}$.
(B) both continuous and differentiable on $R-\{1\}$
(C) continuous on $R-\{-1\}$and differentiable on $R-\{-1,1\}$
(D) both continuous and differentiable on $R-\{-1\}$

Answer: (A) continuous on $R-\{1\}$ and differentiable on $R-\{-1,1\}$. · Key from source paper

---

Q180 JEE Main 2020 · 4 Sep · Shift 2 MCQ

Let $f:(0,\infty)\to(0,\infty)$ be a differentiable function such that $f(1)=e$ and $\lim_{t\to x}\frac{t^2f^2(x)-x^2f^2(t)}{t-x}=0$. If $f(x)=1$, then x is equal to:

(A) $\frac{1}{e}$
(B) $2e$
(C) $\frac{1}{2e}$
(D) e

Answer: (A) $\frac{1}{e}$ · Key from source paper

Q181 JEE Main 2020 · 3 Sep · Shift 1 MCQ

Let $[t]$ denote the greatest integer $\le t$. If $\lambda\in R-\{0,\ 1\}$, $\lim_{x\to 0}\left|\frac{1-x+|x|}{\lambda-x+[x]}\right|=L$, then L is equal to

(A) 1
(B) 2
(C) $\frac{1}{2}$
(D) 0

Answer: (B) 2 · Key from source paper

Q182 JEE Main 2020 · 3 Sep · Shift 1 Numerical

If $\lim_{x\to 0}\left\{\frac{1}{x^8}\left(1-\cos\frac{x^2}{2}-\cos\frac{x^2}{4}+\cos\frac{x^2}{2}\cos\frac{x^2}{4}\right)\right\}=2^{-k}$ then the value of k is

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q183 JEE Main 2020 · 3 Sep · Shift 2 MCQ

$\lim\limits_{x\to a}\dfrac{(a+2x)^{\frac{1}{3}}-(3x)^{\frac{1}{3}}}{(3a+x)^{\frac{1}{3}}-(4x)^{\frac{1}{3}}}$ $(a\neq 0)$ is equal to:

(A) $\left(\frac{2}{9}\right)\left(\frac{2}{3}\right)^{\frac{1}{3}}$
(B) $\left(\frac{2}{3}\right)^{\frac{4}{3}}$
(C) $\left(\frac{2}{9}\right)^{\frac{4}{3}}$
(D) $\left(\frac{2}{3}\right)\left(\frac{2}{9}\right)^{\frac{1}{3}}$

Answer: (D) $\left(\frac{2}{3}\right)\left(\frac{2}{9}\right)^{\frac{1}{3}}$ · Key from source paper

---

Q184 JEE Main 2020 · 2 Sep · Shift 1 MCQ

If a function $f(x)$ defined by $f(x)=\begin{cases}ae^x+be^{-x}, & -1\le x<1\\ cx^2, & 1\le x\le 3\\ ax^2+2cx, & 3<x\le 4\end{cases}$ be continuous for some $a,b,c\in R$ and $f'(0)+f'(2)=e$, then the value of a is

(A) $\frac{1}{e^2-3e+13}$
(B) $\frac{e}{e^2-3e-13}$
(C) $\frac{e}{e^2+3e+13}$
(D) $\frac{e}{e^2-3e+13}$

Answer: (D) $\frac{e}{e^2-3e+13}$ · Key from source paper

Q185 JEE Main 2020 · 2 Sep · Shift 1 Numerical

If $\lim_{x\to 1}\frac{x+x^2+x^3+\ldots+x^n-n}{x-1}=820$, $(n\in N)$ then the value of n is equal to....

Numerical value type: the answer is a number.

Answer: 40. · Key from source paper

EdLoop JEE

Q186 JEE Main 2020 · 2 Sep · Shift 2 MCQ

$\lim_{x\to 0}\left(\tan\left(\frac{\pi}{4}+x\right)\right)^{1/x}$ is equal to

(A) e
(B) 2
(C) 1
(D) e^2

Answer: (D) e^2 · Key from source paper

Q187 JEE Main 2020 · 9 Jan · Shift 1 MCQ

If $f(x)=\begin{cases}\frac{\sin(a+2)x+\sin x}{x} & ;x<0\\ b & ;x=0\\ \frac{(x+3x^2)^{1/3}-x^{1/3}}{x^{1/3}} & ;x>0\end{cases}$ is continuous at $x=0$, then $a+2b$ is equal to:

(A) 1
(B) -1
(C) 0
(D) -2

Answer: (C) 0 · Key from source paper

Q188 JEE Main 2020 · 9 Jan · Shift 2 MCQ

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

(A) $\sqrt{A+1}$
(B) $\sqrt{A+5}$
(C) $\sqrt{A+21}$
(D) $\sqrt{A}$

Answer: (A) $\sqrt{A+1}$ · Key from source paper

Q189 JEE Main 2020 · 8 Jan · Shift 1 MCQ

$\lim_{x\to 0}\left(\frac{3x^2+2}{7x^2+2}\right)^{\frac{1}{x^2}}$ is equal to

(A) $\frac{1}{e}$
(B) $\frac{1}{e^2}$
(C) e^2
(D) e

Answer: (B) $\frac{1}{e^2}$ · Key from source paper

Q190 JEE Main 2020 · 8 Jan · Shift 2 MCQ

$\lim_{x\to 0} \frac{\int_0^x t\sin(10t)dt}{x}$, is equal to

(A) 0
(B) $\frac{1}{10}$
(C) $-\frac{1}{5}$
(D) $-\frac{1}{10}$

Answer: (A) 0 · Key from source paper

Q191 JEE Main 2020 · 7 Jan · Shift 1 Numerical

$\lim_{x\to 2} \frac{3^x+3^{3-x}-12}{3^{-x/2}-3^{1-x}}$ is equal to

Numerical value type: the answer is a number.

Answer: 36. · Key from source paper

Q192 JEE Main 2020 · 7 Jan · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q193 JEE Main 2020 · 7 Jan · Shift 2 Numerical

If the function f defined on $\left(-\frac{1}{3}, 1/3\right)$ by $f(x) = \begin{cases} \frac{1}{x}\log_e\left(\frac{1+3x}{1-2x}\right), & \text{when } x \neq 0 \\ k, & \text{when } x = 0 \end{cases}$, is continuous, then k is equal to.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q194 JEE Main 2019 · 12 Apr · Shift 2 MCQ

$\lim_{x\to 0} \frac{x+2\sin x}{\sqrt{x^2+2\sin x+1}-\sqrt{\sin^2 x-x+1}}$ is

(A) 3
(B) 1
(C) 2
(D) 6

Answer: (C) 2 · Key from source paper

Q195 JEE Main 2019 · 12 Apr · Shift 2 MCQ

Let $f(x) = 5 - |x-2|$ and $g(x) = |x+1|$, $x \in R$. If $f(x)$ attains maximum value at α and $g(x)$ attains minimum value at β, then $\lim_{x\to-\alpha\beta} \frac{(x-1)(x^2-5x+6)}{x^2-6x+8}$ is equal to:

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

Answer: (B) $\frac{1}{2}$ · Key from source paper

Q196 JEE Main 2019 · 10 Apr · Shift 1 MCQ

If $\lim_{x\to1} \frac{x^4-1}{x-1} = \lim_{x\to k} \frac{x^3-k^3}{x^2-k^2}$, then k is

(A) $\frac{3}{2}$
(B) $\frac{4}{3}$
(C) $\frac{3}{8}$
(D) $\frac{8}{3}$

Answer: (D) $\frac{8}{3}$ · Key from source paper

Q197 JEE Main 2019 · 10 Apr · Shift 1 MCQ

Let $f : R \to R$ be differentiable at $c \in R$ and $f(c) = 0$. If $g(x) = |f(x)|$, then at $x = c$, g is:

(A) not differentiable
(B) not differentiable if $f'(c) = 0$
(C) differentiable if $f'(c) = 0$
(D) differentiable if $f'(c) \neq 0$

Answer: (C) differentiable if $f'(c) = 0$ · Key from source paper

Q198 JEE Main 2019 · 10 Apr · Shift 1 MCQ

If $f(x) = \begin{cases} \frac{\sin(p+1)x+\sin x}{x}, & x<0 \\ q, & x=0 \\ \frac{\sqrt{x+x^2}-\sqrt{x}}{x^{3/2}}, & x>0 \end{cases}$ is continuous at $x = 0$, then the ordered pair $(p,\ q)$ is equal to:

(A) $\left(-\frac{3}{2}, -\frac{1}{2}\right)$
(B) $\left(-\frac{1}{2}, \frac{3}{2}\right)$
(C) $\left(\frac{5}{2}, \frac{1}{2}\right)$
(D) $\left(-\frac{3}{2}, \frac{1}{2}\right)$

Answer: (D) $\left(-\frac{3}{2}, \frac{1}{2}\right)$ · Key from source paper

Q199 JEE Main 2019 · 10 Apr · Shift 2 MCQ

If $\lim_{x\to 1}\frac{x^2-ax+b}{x-1}=5$, then $a+b$ is equal to:

(A) 1

(B) 5

(C) -4

(D) -7

Answer: (D) -7 · Key from source paper

Q200 JEE Main 2019 · 9 Apr · Shift 1 MCQ

Let $f(x)=15-|x-10|;\ x\in R$. Then the set of all values of x, at which the function $g(x)=f(f(x))$ is not differentiable, is:

(A) $\{5,10,15\}$

(B) $\{10\}$

(C) $\{10,15\}$

(D) $\{5,10,15,20\}$

Answer: (A) $\{5,10,15\}$ · Key from source paper

Q201 JEE Main 2019 · 9 Apr · Shift 1 MCQ

If the function f defined on $\left(\frac{\pi}{6},\frac{\pi}{3}\right)$ by $f(x)=\begin{cases}\frac{\sqrt{2}\cos x-1}{\cot x-1}, & x\neq\frac{\pi}{4}\\ k, & x=\frac{\pi}{4}\end{cases}$ is continuous, then k is equal to

(A) $\frac{1}{2}$

(B) 1

(C) 2

(D) $\frac{1}{\sqrt{2}}$

Answer: (A) $\frac{1}{2}$ · Key from source paper

Q202 JEE Main 2019 · 9 Apr · Shift 2 MCQ

If $f(x)=[x]-\left[\frac{x}{4}\right],\ x\in R$, where $[x]$ denotes the greatest integer function, then:

EdLoop JEE

(A) $\lim_{x\to 4+} f(x)$ exists but $\lim_{x\to 4-} f(x)$ does not exist
(B) f is continuous at $x = 4$
(C) $\lim_{x\to 4-} f(x)$ exists but $\lim_{x\to 4+} f(x)$ does not exist
(D) Both $\lim_{x\to 4-} f(x)$ and $\lim_{x\to 4+} f(x)$ exist but are not equal

Answer: (B) f is continuous at $x = 4$ · Key from source paper

Q203 JEE Main 2019 · 9 Apr · Shift 2 MCQ

If the function $f(x) = \begin{cases} a|\pi - x| + 1, & x \le 5 \\ b|x - \pi| + 3, & x > 5 \end{cases}$ is continuous at $x = 5$, then the value of $a - b$ is:

(A) $\frac{2}{5-\pi}$
(B) $\frac{-2}{\pi+5}$
(C) $\frac{2}{\pi+5}$
(D) $\frac{2}{\pi-5}$

Answer: (A) $\frac{2}{5-\pi}$ · Key from source paper

Q204 JEE Main 2019 · 8 Apr · Shift 1 MCQ

$\lim_{x\to 0} \frac{\sin^2 x}{\sqrt{2} - \sqrt{1+\cos x}}$ equals

(A) $4\sqrt{2}$
(B) $2\sqrt{2}$
(C) $\sqrt{2}$
(D) 4

Answer: (A) $4\sqrt{2}$ · Key from source paper

Q205 JEE Main 2019 · 8 Apr · Shift 2 MCQ

Let $f : R \to R$ be a differentiable function satisfying $f'3 + f'2 = 0$. Then $\lim_{x\to 0} \frac{1+f3+x-f3}{1+f2-x-f2}^{\frac{1}{x}}$ is equal to

(A) 1
(B) e
(C) e^2
(D) e^{-1}

Answer: (A) 1 · Key from source paper

Q206 JEE Main 2019 · 8 Apr · Shift 2 MCQ

Let $f:[-1,3]\to\mathbb{R}$ be defined as

$$f(x)=\begin{cases}|x|+[x], & -1\le x<1\\ x+|x|, & 1\le x<2\\ x+[x], & 2\le x\le 3,\end{cases}$$

where $[t]$ denotes the greatest integer less than or equal to t. Then, f is discontinuous at:

(A) Only one point
(B) Only two points
(C) Four or more points
(D) Only three points

Answer: (D) Only three points · Key from source paper

Q207 JEE Main 2019 · 12 Jan · Shift 1 MCQ

$\lim_{x\to\frac{\pi}{4}}\dfrac{\cot^3 x-\tan x}{\cos\left(x+\frac{\pi}{4}\right)}$ is

(A) $4\sqrt{2}$
(B) $8\sqrt{2}$
(C) 4
(D) 8

Answer: (D) 8 · Key from source paper

Q208 JEE Main 2019 · 12 Jan · Shift 1 MCQ

Let S be the set of all points in $(-\pi,\ \pi)$ at which the function, $f(x)=\min\{\sin x,\ \cos x\}$ is not differentiable. Then S is a subset of which of the following?

(A) $\left\{-\frac{3\pi}{4},-\frac{\pi}{2},\frac{\pi}{2},\frac{3\pi}{4}\right\}$
(B) $\left\{-\frac{3\pi}{4},-\frac{\pi}{4},\frac{3\pi}{4},\frac{\pi}{4}\right\}$
(C) $\left\{-\frac{\pi}{4},0,\frac{\pi}{4}\right\}$
(D) $\left\{-\frac{\pi}{2},-\frac{\pi}{4},\frac{\pi}{4},\frac{\pi}{2}\right\}$

Answer: (B) $\left\{-\frac{3\pi}{4},-\frac{\pi}{4},\frac{3\pi}{4},\frac{\pi}{4}\right\}$ · Key from source paper

Q209 JEE Main 2019 · 12 Jan · Shift 2 MCQ

$\lim_{x\to1^-}\dfrac{\sqrt{\pi}-\sqrt{2\sin^{-1}x}}{\sqrt{1-x}}$ is equal to

EdLoop JEE

(A) $\sqrt{\pi}$
(B) $\sqrt{\frac{2}{\pi}}$
(C) $\frac{1}{\sqrt{2\pi}}$
(D) $\sqrt{\frac{\pi}{2}}$

Answer: (B) $\sqrt{\frac{2}{\pi}}$ · Key from source paper

Q210 JEE Main 2019 · 11 Jan · Shift 1 MCQ

Let [x] denote the greatest integer less than or equal to X. Then : $\lim_{x\to 0} \frac{\tan\left(\pi \sin^2 x\right)+(|x|-\sin(x[x]))^2}{x^2}$

(A) does not exist
(B) equals π
(C) equals $\pi + 1$
(D) equals 0

Answer: (A) does not exist · Key from source paper

Q211 JEE Main 2019 · 11 Jan · Shift 1 MCQ

Let $f(x) = \begin{cases} -1, & -2 \le x < 0 \\ x^2 - 1, & 0 \le x \le 2 \end{cases}$ and $g(x) = |\eta(x)| + f(x\ |)$. Then, in the interval $(-2, 2)$, g is:

(A) differentiable at all points
(B) not continuous
(C) not differentiable at two points
(D) not differentiable at one point

Answer: (D) not differentiable at one point · Key from source paper

---

Q212 JEE Main 2019 · 11 Jan · Shift 2 MCQ

$\lim_{x\to 0} \frac{x \cot(4x)}{\sin^2 x \cot^2(2x)}$ is equal to:

(A) 0
(B) 2
(C) 4
(D) 1

Answer: (D) 1 · Key from source paper

Q213 JEE Main 2019 · 11 Jan · Shift 2 MCQ

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 :

(A) ϕ (an empty set)
(B) $\{\pi\}$
(C) $\{0\}$
(D) $\{0, \pi\}$

Answer: (A) ϕ (an empty set) · Key from source paper

Q214 JEE Main 2019 · 10 Jan · Shift 1 MCQ

For each $t \in R$, let $[t]$ be the greatest integer less than or equal to t. Then, $\lim_{x \to 1+} \frac{(1-|x|+\sin|1-x|)\sin\left([1-x]\frac{\pi}{2}\right)}{|1-x|[1-x]}$

(A) equals 0
(B) equals -1
(C) does not exist
(D) equal 1

Answer: (A) equals 0 · Key from source paper

Q215 JEE Main 2019 · 10 Jan · Shift 1 MCQ

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

(A) equals $\{-2,\ -1,\ 0,\ 1,\ 2\}$
(B) equals $\{-2,\ 2\}$
(C) is an empty set
(D) equal $\{-2,\ -1,\ 1,\ 2\}$

Answer: (A) equals $\{-2,\ -1,\ 0,\ 1,\ 2\}$ · Key from source paper

Q216 JEE Main 2019 · 10 Jan · Shift 2 MCQ

Let $f : (-1,\ 1) \to R$ be a function defined by $f(x) = max\left\{-|x|,\ -\sqrt{1-x^2}\right\}$. If K be the set of all points at which f is not differentiable, then K has exactly

(A) two elements
(B) one element
(C) three elements
(D) five elements

Answer: (C) three elements · Key from source paper

Q217 JEE Main 2019 · 9 Jan · Shift 1 MCQ

The value of $\lim\limits_{y\to 0}\dfrac{\sqrt{1+\sqrt{1+y^4}}-\sqrt{2}}{y^4}$

(A) exists and equals $\dfrac{1}{2\sqrt{2}}$

(B) exists and equals $\dfrac{1}{4\sqrt{2}}$

(C) does not exist

(D) exists and equals $\dfrac{1}{2\sqrt{2}\sqrt{2}+1}$

Answer: (B) exists and equals $\dfrac{1}{4\sqrt{2}}$ · Key from source paper

Q218 JEE Main 2019 · 9 Jan · Shift 1 MCQ

Let $f : R \to R$ be a function defined as

$$fx = \begin{cases} 5, & \text{if } x \le 1 \\ a+bx, & \text{if } 1 < x < 3 \\ b+5x, & \text{if } 3 \le x < 5 \\ 30, & \text{if } x \ge 5 \end{cases}$$

Then f is:

(A) continuous if $a = -5$ and $b = 10$

(B) continuous if $a = 0$ and $b = 5$

(C) not continuous for any values of a and b

(D) continuous if $a = 5$ and $b = 5$

Answer: (C) not continuous for any values of a and b · Key from source paper

Q219 JEE Main 2019 · 9 Jan · Shift 2 MCQ

For each $x \in R$, let $[x]$ be the greatest integer less than or equal to x. Then $\lim\limits_{x\to 0^-}\dfrac{x([x]+|x|)\sin[x]}{|x|}$ is equal to

(A) 1

(B) 0

(C) $-\sin 1$

(D) $\sin 1$

Answer: (C) $-\sin 1$ · Key from source paper

Q220 JEE Main 2019 · 9 Jan · Shift 2 MCQ

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

(A) 0
(B) 1
(C) 2
(D) $\frac{1}{2}$

Answer: (B) 1 · Key from source paper

Q221 JEE Main 2018 · 16 Apr · Online MCQ

$\lim_{x\to 0} \frac{(27+x)^{\frac{1}{3}}-3}{9-(27+x)^{\frac{2}{3}}}$ equals

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

Answer: (A) $-\frac{1}{6}$ · Key from source paper

Q222 JEE Main 2018 · 16 Apr · Online MCQ

If the function f defined as $f(x) = \frac{1}{x} - \frac{k-1}{e^{2x}-1}$, $x \neq 0$ is continuous at $x = 0$, then ordered pair $(k, f(0))$ is equal to

(A) $(2, 1)$
(B) $(3, 1)$
(C) $(3, 2)$
(D) $\left(\frac{1}{3}, 2\right)$

Answer: (B) $(3, 1)$ · Key from source paper

Q223 JEE Main 2018 · 15 Apr · Shift 1 MCQ

Let $S = \{(\lambda, \mu) \in R \times R : f(t) = (|\lambda|e^t - \mu) \cdot \sin(2|t|), t \in R,$ is a differentiable function $\}$. Then S is a subest (sic) of?

(A) $R \times [0, \infty)$
(B) $(-\infty, 0) \times R$
(C) $[0, \infty) \times R$
(D) $R \times (-\infty, 0)$

Answer: (A) $R \times [0, \infty)$ · Key from source paper

Q224 JEE Main 2018 · 15 Apr · Shift 2 MCQ

$\lim_{x\to 0} \frac{x\tan 2x - 2x\tan x}{(1-\cos 2x)^2}$ equals.

(A) 1
(B) $-\frac{1}{2}$
(C) $\frac{1}{4}$
(D) $\frac{1}{2}$

Answer: (D) $\frac{1}{2}$ · Key from source paper

Q225 JEE Main 2018 · 15 Apr · Shift 2 MCQ

Let $f(x) = \begin{cases} (x-1)^{\frac{1}{2-x}}, & x > 1, x \neq 2 \\ k, & x = 2 \end{cases}$ The value of k for which f is continuous at $x = 2$ is

(A) e^{-2}
(B) e
(C) e^{-1}
(D) 1

Answer: (C) e^{-1} · Key from source paper

Q226 JEE Main 2018 · 8 Apr · Offline MCQ

For each $t \in R$, let $[t]$ be the greatest integer less than or equal to t. Then
$\lim_{x \to 0^+} x\left(\left[\frac{1}{x}\right] + \left[\frac{2}{x}\right] + \ldots + \left[\frac{15}{x}\right]\right)$

(A) does not exist (in R)
(B) is equal to 0
(C) is equal to 15
(D) is equal to 120

Answer: (D) is equal to 120 · Key from source paper

Q227 JEE Main 2018 · 8 Apr · Offline MCQ

Let $S = \{t \in R : f(x) = |x - \pi| \cdot (e^{|x|} - 1) \sin |x| \text{ is not differentiable at } t\}$. Then, the set S is equal to:

(A) $\{0, \pi\}$
(B) ϕ (an empty set)
(C) $\{0\}$
(D) $\{\pi\}$

Answer: (B) ϕ **(an empty set)** · Key from source paper

Q228 JEE Main 2017 · 9 Apr · Online MCQ

The value of k which the function $f(x) = \begin{cases} \left(\frac{4}{5}\right)^{\frac{\tan 4x}{\tan 5x}}, & 0 < x < \frac{\pi}{2} \\ k + \frac{2}{5}, & x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$, is

(A) $\frac{2}{5}$
(B) $-\frac{2}{5}$
(C) $\frac{17}{20}$
(D) $\frac{3}{5}$

Answer: (D) $\frac{3}{5}$ · Key from source paper

Q229 JEE Main 2017 · 8 Apr · Online MCQ

$\lim_{x\to 3} \frac{\sqrt{3x}-3}{\sqrt{2x-4}-\sqrt{2}}$ is equal to

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

Answer: (A) $\frac{1}{\sqrt{2}}$ · Key from source paper

Q230 JEE Main 2017 · 2 Apr · Offline MCQ

$\lim_{x\to \frac{\pi}{2}} \frac{\cot x - \cos x}{(\pi-2x)^3}$ equals

(A) $\frac{1}{24}$
(B) $\frac{1}{16}$
(C) $\frac{1}{8}$
(D) $\frac{1}{4}$

Answer: (B) $\frac{1}{16}$ · Key from source paper

Q231 JEE Main 2016 · 10 Apr · Online MCQ

$\lim_{x\to 0} \frac{(1-\cos 2x)^2}{2x\tan x - x\tan 2x}$ is

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

Answer: (C) -2 · Key from source paper

Q232 JEE Main 2016 · 10 Apr · Online MCQ

Let $a, b \in R,\ (a \neq 0)$. If the function f, defined as

$f(x) = \begin{cases} \frac{2x^2}{a}, & 0 \leq x < 1 \\ a, & 1 \leq x < \sqrt{2} \\ \frac{2b^2-4b}{x^3}, & \sqrt{2} \leq x < 8 \end{cases}$,is continuous in the interval $[0, \infty)$, then an ordered pair (a, b) can be

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

Answer: (C) $(\sqrt{2}, 1-\sqrt{3})$ · Key from source paper

Q233 JEE Main 2016 · 9 Apr · Online MCQ

If $\lim_{x\to\infty}\left(1+\frac{a}{x}-\frac{4}{x^2}\right)^{2x} = e^3$, then a is equal to

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

Answer: (B) $\frac{3}{2}$ · Key from source paper

Q234 JEE Main 2016 · 9 Apr · Online MCQ

If the function $f(x) = \begin{cases} -x, & x < 1 \\ a + \cos^{-1}(x+b), & 1 \leq x \leq 2 \end{cases}$ is differentiable at $x = 1$, then $\frac{a}{b}$ is equal to

(A) $\frac{\pi+2}{2}$
(B) $\frac{\pi-2}{2}$
(C) $\frac{-\pi-2}{2}$
(D) $-1-\cos^{-1}(2)$

Answer: (A) $\frac{\pi+2}{2}$ · Key from source paper

Q235 JEE Main 2016 · 3 Apr · Offline MCQ

Let $P = \lim_{x\to 0^+}\left(1+\tan^2\sqrt{x}\right)^{\frac{1}{2x}}$, then $\log P$ is equal to

(A) $\frac{1}{2}$
(B) $\frac{1}{4}$
(C) 2
(D) 1

Answer: (A) $\frac{1}{2}$ · Key from source paper

Q236 JEE Main 2016 · 3 Apr · Offline MCQ

For $x \in R$, $f(x) = |\log 2 - \sin x|$ and $g(x) = f(f(x))$, then

(A) $g'(0) = -\cos(\log 2)$

(B) g is differentiable at $x = 0$ and $g'(0) = -\sin(\log 2)$

(C) g is not differentiable at $x = 0$

(D) $g'(0) = \cos(\log 2)$

Answer: (D) $g'(0) = \cos(\log 2)$ · Key from source paper

Q237 JEE Main 2015 · 11 Apr · Online MCQ

Let k be a non - zero real number. If $f(x) = \begin{cases} \dfrac{(e^x - 1)^2}{\sin\left(\frac{x}{k}\right)\log\left(1 + \frac{x}{4}\right)}, & x \neq 0 \\ 12 & , \ x = 0 \end{cases}$ is a continuous function at $x = 0$, then the value of k is

(A) 2

(B) 4

(C) 3

(D) 1

Answer: (C) 3 · Key from source paper

Q238 JEE Main 2015 · 10 Apr · Online MCQ

$\lim_{x \to 0} \frac{e^{x^2} - \cos x}{\sin^2 x}$ is equal to

(A) 2

(B) $\frac{3}{2}$

(C) $\frac{5}{4}$

(D) 3

Answer: (B) $\frac{3}{2}$ · Key from source paper

Q239 JEE Main 2015 · 4 Apr · Offline MCQ

$$\lim_{x \to 0} \frac{(1 - \cos 2x)(3 + \cos x)}{x \tan 4x} =$$

(A) $\frac{1}{2}$

(B) 4

(C) 3

(D) 2

Answer: (D) 2 · Key from source paper

EdLoop JEE

Q240 JEE Main 2015 · 4 Apr · Offline MCQ

If the function $g(x) = \begin{cases} k\sqrt{x+1}, & 0 \le x \le 3 \\ mx+2, & 3 < x \le 5 \end{cases}$ is differentiable, then the value of $k+m$ is

(A) 4
(B) 2
(C) $\frac{16}{5}$
(D) $\frac{10}{3}$

Answer: (B) 2 · Key from source paper

Q241 JEE Main 2014 · 19 Apr · Online MCQ

If the function $f(x) = \begin{cases} \frac{\sqrt{2+\cos x}-1}{(\pi-x)^2}, & x \neq \pi \\ k, & x = \pi \end{cases}$ is continuous at $x = \pi$, then k equals

(A) $\frac{1}{4}$
(B) 0
(C) 2
(D) $\frac{1}{2}$

Answer: (A) $\frac{1}{4}$ · Key from source paper

Q242 JEE Main 2014 · 19 Apr · Online MCQ

Let $f : R \to R$ be a function such that $|f(x)| \le x^2$, for all $x \in R$. Then, at $x = 0$, f is

(A) differentiable but not continuous
(B) neither continuous nor differentiable
(C) continuous as well as differentiable
(D) continuous but not differentiable

Answer: (C) continuous as well as differentiable · Key from source paper

Q243 JEE Main 2014 · 12 Apr · Online MCQ

Let $f, g : R \to R$ be two functions defined by $f(x) = \begin{cases} x \sin\left(\frac{1}{x}\right) & , x \neq 0 \\ 0, & , x = 0 \end{cases}$ and $g(x) = xf(x)$

Statement I: f is a continuous function at x = 0. Statement II: g is a differentiable function at $x = 0$.

(A) Both statement I and II are false.
(B) Both statement I and II are true.
(C) Statement I is true, statement II is false.
(D) Statement I is false, statement II is true.

Answer: (B) Both statement I and II are true. · Key from source paper

Q244 JEE Main 2014 · 11 Apr · Online MCQ

If $\lim_{x\to 2} \frac{\tan(x-2)\{x^2+(k-2)x-2k\}}{x^2-4x+4} = 5$, then k is equal to:

(A) 0
(B) 1
(C) 2
(D) 3

Answer: (D) 3 · Key from source paper

Q245 JEE Main 2014 · 11 Apr · Online MCQ

Let $f(x) = x|x|$, $g(x) = \sin x$ and $h(x) = (g \circ f)(x)$. Then

(A) $\mathrm{h(x)}$ is not differentiable at $\mathrm{x} = 0$.
(B) $\mathrm{h(x)}$ is differentiable at $\mathrm{x} = 0$, but $\mathrm{h'(x)}$ is not continuous at $x = 0$
(C) $\mathrm{h'(x)}$ is continuous at $\mathrm{x} = 0$ but it is not differentiable at $x = 0$
(D) $\mathrm{h'(x)}$ is differentiable at $\mathrm{x} = 0$

Answer: (C) $\mathrm{h'(x)}$ is continuous at $\mathrm{x} = 0$ but it is not differentiable at $x = 0$ · Key from source paper

Q246 JEE Main 2014 · 9 Apr · Online MCQ

If $f(x)$ is continuous and $f\left(\frac{9}{2}\right) = \frac{2}{9}$, then $\lim_{x\to 0} f\left(\frac{1-\cos 3x}{x^2}\right)$ equals to

(A) $\frac{8}{9}$
(B) 0
(C) $\frac{2}{9}$
(D) $\frac{9}{2}$

Answer: (C) $\frac{2}{9}$ · Key from source paper

Q247 JEE Main 2014 · 6 Apr · Offline MCQ

$\lim_{x\to 0} \frac{\sin\left(\pi \cos^2 x\right)}{x^2}$ is equal to

(A) $-\pi$

(B) π

(C) $\frac{\pi}{2}$

(D) 1

Answer: (B) π · Key from source paper

Q248 JEE Main 2013 · 25 Apr · Online MCQ

Consider the function : $f(x) = [x] + |1 - x|, -1 \leq x \leq 3$ where $[x]$ is the greatest integer function.

Statement 1: f is not continuous at $x = 0, 1, 2$ and 3 Statement 2: $f(x) = \begin{cases} -x, & -1 \leq x < 0 \\ 1 - x, & 0 \leq x < 1 \\ 1 + x, & 1 \leq x < 2 \\ 2 + x, & 2 \leq x \leq 3 \end{cases}$

(A) Statement 1 is true; Statement 2 is false,

(B) Statement 1 is true; Statement 2 is true; Statement 2 is not correct explanation for Statement 1.

(C) Statement 1 is true; Statement 2 is true; Statement It is a correct explanation for Statement 1.

(D) Statement 1 is false; Statement 2 is true.

Answer: (A) Statement 1 is true; Statement 2 is false, · Key from source paper

---

Q249 JEE Main 2013 · 23 Apr · Online MCQ

Let f be a composite function of x defined by $f(u) = \frac{1}{u^2+u-2}$, $u(x) = \frac{1}{x-1}$. Then the number of points x where f is discontinuous is :

(A) 4

(B) 3

(C) 2

(D) 1

Answer: (B) 3 · Key from source paper

Q250 JEE Main 2013 · 22 Apr · Online MCQ

Let $f(x) = -1 + |x - 2|$, and $g(x) = 1 - |x|$; then the set of all points where f_{og} is discontinuous is :

(A) $\{0, 2\}$

(B) $\{0, 1, 2\}$

(C) $\{0\}$

(D) an empty set

Answer: (D) an empty set · Key from source paper

Q251 JEE Main 2013 · 9 Apr · Online MCQ

The value of $\lim_{x\to 0}\frac{1}{x}\left[\tan^{-1}\left(\frac{x+1}{2x+1}\right)-\frac{\pi}{4}\right]$ is :

(A) 1
(B) $-\frac{1}{2}$
(C) 2
(D) 0

Answer: (B) $-\frac{1}{2}$ · Key from source paper

Q252 JEE Main 2013 · 9 Apr · Online MCQ

Statement-1: The equation $x\log x = 2-x$ is satisfied by at least one value of x lying between 1 and 2. Statement-2: The function $f(x)=x\log x$ is an increasing function in $[1,2]$ and $g(x)=2-x$ is a decreasing function in $[1,2]$ and the graphs represented by these functions intersect at a point in $[1,2]$

(A) Statement-1 is true; Statement-2 is true; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is true; Statement-2 is true; Statement-2 is not correct explanation for Statement-1.
(C) Statement-1 1 is false, Statement- 2 is true.
(D) Statement-1 1 is true, Statement- 2 is false.

Answer: (A) Statement-1 is true; Statement-2 is true; Statement-2 is a correct explanation for Statement-1. · Key from source paper

Q253 JEE Main 2013 · 7 Apr · Offline MCQ

The value of $\lim_{x\to 0}\frac{(1-\cos 2x)(3+\cos x)}{x\tan 4x}$ is equal to

(A) 1
(B) 2
(C) $-\frac{1}{4}$
(D) $\frac{1}{2}$

Answer: (B) 2 · Key from source paper

Q254 AIEEE 2012 · 26 May · Online MCQ

$\lim_{x\to 0}\frac{\sin(\pi\cos^2 x)}{x^2}$ equals

(A) $-\pi$
(B) 1
(C) -1
(D) π

Answer: (D) π · Key from source paper

Q255 AIEEE 2012 · 26 May · Online MCQ

If $f(x) = a|\sin x| + be^{|x|} + c|x|^3$, where $a, b, c \in R$, is differentiable at $x = 0$, then

(A) $a = 0$, b and c are any real numbers
(B) $c = 0, a = 0$, b is any real number
(C) $b = 0, c = 0$, a is any real number
(D) $a = 0, b = 0$, c is any real number

Answer: (D) $a = 0, b = 0$, c **is any real number** · Key from source paper

---

Q256 AIEEE 2012 · 19 May · Online MCQ

If $f(x) = 3x^{10} - 7x^8 + 5x^6 - 21x^3 + 3x^2 - 7$, then $\lim_{\alpha \to 0} \frac{f(1-\alpha)-f(1)}{\alpha^3+3\alpha}$ is

(A) $-\frac{53}{3}$
(B) $\frac{53}{3}$
(C) $-\frac{55}{3}$
(D) $\frac{55}{3}$

Answer: (B) $\frac{53}{3}$ · Key from source paper

Q257 AIEEE 2012 · 19 May · Online MCQ

Let $f : [1, 3] \to R$ be a function satisfying $\frac{x}{[x]} \leq f(x) \leq \sqrt{6 - x}$, for all $x \neq 2$ and $f(2) = 1$, where R is the set of all real numbers and $[x]$ denotes the largest integer less than or equal to x. Statement 1: $\lim_{x \to 2^-} f(x)$ exists. Statement 2: f is continuous at $x = 2$.

(A) Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 1.
(B) Statement 1 is false, Statement 2 is true.
(C) Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanation for Statement 1.
(D) Statement 1 is true, Statement 2 is false.

Answer: (D) Statement 1 is true, Statement 2 is false. · Key from source paper

---

Q258 AIEEE 2012 · 12 May · Online MCQ

Statement 1: A function $f : R \to R$ is continuous at x_0 if and only if $\lim_{x \to x_0} f(x)$ exists and $\lim_{x \to x_0} f(x) = f(x_0 \cdot)$ Statement 2: A function $f : R \to R$ is discontinuous at x_0 if and only if, $\lim_{x \to x_0} f(x)$ exists and $\lim_{x \to x_0} f(x) \neq f(x_0 .)$

(A) Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanation of Statement 1.
(B) Statement 1 is false, Statement 2 is true.
(C) Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation of Statement 1.
(D) Statement 1 is true, Statement 2 is false.

Answer: (D) Statement 1 is true, Statement 2 is false. · Key from source paper

Q259 AIEEE 2012 · 7 May · Online MCQ

$\lim_{x\to 0}\left(\frac{x-\sin x}{x}\right)\sin\left(\frac{1}{x}\right)$

(A) equals 1
(B) equals 0
(C) does not exist
(D) equals -1

Answer: (B) equals 0 · Key from source paper

Q260 AIEEE 2012 · 7 May · Online MCQ

If $x+|y|=2y$, then y as a function of x, at $x=0$ is

(A) differentiable but not continuous
(B) continuous but not differentiable
(C) continuous as well as differentiable
(D) neither continuous nor differentiable

Answer: (B) continuous but not differentiable · Key from source paper

Q261 AIEEE 2012 · Offline MCQ

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

(A) continuous for every real x
(B) discontinuous only at $x=0$
(C) discontinuous only at non-zero integral values of x
(D) continuous only at $x=0$

Answer: (A) continuous for every real x · Key from source paper

Q262 AIEEE 2011 MCQ

$$\lim_{x\to 2}\left(\frac{\sqrt{1-\cos\{2(x-2)\}}}{x-2}\right)$$

(A) equals $\sqrt{2}$
(B) equals $-\sqrt{2}$
(C) equals $\frac{1}{\sqrt{2}}$
(D) does not exist

Answer: (D) does not exist · Key from source paper

Q263 AIEEE 2011 MCQ

The value of p and q for which the function $f(x) = \begin{cases} \frac{\sin(p+1)x+\sin x}{x} & x<0 \\ q & ,x=0 \\ \frac{\sqrt{x+x^2}-\sqrt{x}}{x^{3/2}} & ,x>0 \end{cases}$ is continuous for all x in R, is

(A) $p=\frac{5}{2}, q=\frac{1}{2}$
(B) $p=-\frac{3}{2}, q=\frac{1}{2}$
(C) $p=\frac{1}{2}, q=\frac{3}{2}$
(D) $p=\frac{1}{2}, q=-\frac{3}{2}$

Answer: (B) $p=-\frac{3}{2}, q=\frac{1}{2}$ · Key from source paper

Q264 AIEEE 2010 MCQ

Let $f: R \to R$ be a positive increasing function with $\lim_{x\to\infty} \frac{f(3x)}{f(x)} = 1$. Then $\lim_{x\to\infty} \frac{f(2x)}{f(x)} =$

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

Answer: (D) 1 · Key from source paper

Q265 AIEEE 2009 MCQ

Let $f(x) = x|x|$ and $g(x) = \sin x$. Statement-1 : gof is differentiable at $x=0$ and its derivative is continuous at that point. Statement-2 : gof is twice differentiable at $x=0$.

(A) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1
(B) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1
(C) Statement-1 is true, Statement-2 is false
(D) Statement-1 is false, Statement-2 is true

Answer: (C) Statement-1 is true, Statement-2 is false · Key from source paper

Q266 AIEEE 2008 MCQ

Let $f(x) = \begin{cases} (x-1)\sin\left(\frac{1}{x-1}\right), & \text{if } x \neq 1 \\ 0, & \text{if } x = 1 \end{cases}$. Then which one of the following is true?

(A) f is neither differentiable at $x = 0$ nor at $x = 1$
(B) f is differentiable at $x = 0$ and at $x = 1$
(C) f is differentiable at x = 0 but not at x = 1
(D) f is differentiable at x = 1 but not at x = 0

Answer: (C) f is differentiable at x = 0 but not at x = 1 · Checked by our team

Q267 AIEEE 2007 MCQ

The function $f : R \sim \{0\} \to R$ given by $f(x) = \frac{1}{x} - \frac{2}{e^{2x}-1}$ can be made continuous at $x = 0$ by defining $f(0)$ as

(A) 2
(B) -1
(C) 0
(D) 1

Answer: (D) 1 · Key from source paper

Q268 AIEEE 2007 MCQ

Let $f : R \to R$ be a function defined by $f(x) = \text{Min}\{x + 1, |x| + 1\}$. Then which of the following is true?

(A) $f(x) \geq 1$ for all $x \in R$
(B) $f(x)$ is not differentiable at $x = 1$
(C) $f(x)$ is differentiable everywhere
(D) $f(x)$ is not differentiable at $x = 0$

Answer: (C) $f(x)$ is differentiable everywhere · Key from source paper

Q269 AIEEE 2006 MCQ

The set of points where $f(x) = \frac{x}{1+|x|}$ is differentiable is

(A) $(-\infty, 0) \cup (0, \infty)$
(B) $(-\infty, -1) \cup (-1, \infty)$
(C) $(-\infty, \infty)$
(D) $(0, \infty)$

Answer: (C) $(-\infty, \infty)$ · Key from source paper

EdLoop JEE

Q270 AIEEE 2005 MCQ

Let α and β be the distinct roots of $ax^2+bx+c=0$, then $\lim_{x\to\alpha}\frac{1-\cos(ax^2+bx+c)}{(x-\alpha)^2}$ is equal to

(A) $\frac{a^2}{2}(\alpha-\beta)^2$
(B) 0
(C) $-\frac{a^2}{2}(\alpha-\beta)^2$
(D) $\frac{1}{2}(\alpha-\beta)^2$

Answer: (A) $\frac{a^2}{2}(\alpha-\beta)^2$ · Key from source paper

Q271 AIEEE 2005 MCQ

Suppose $f(x)$ is differentiable $x=1$ and $\lim_{h\to0}\frac{1}{h}f(1+h)=5$, then $f'(1)$ equals

(A) 3
(B) 4
(C) 5
(D) 6

Answer: (C) 5 · Key from source paper

Q272 AIEEE 2005 MCQ

If f is a real-valued differentiable function satisfying $|f(x)-f(y)|\le(x-y)^2$, $x,y\in R$ and $f(0)=0$, then $f(1)$ equals

(A) -1
(B) 0
(C) 2
(D) 1

Answer: (B) 0 · Key from source paper

Q273 AIEEE 2004 MCQ

If $\lim_{x\to\infty}\left(1+\frac{a}{x}+\frac{b}{x^2}\right)^{2x}=e^2$, then the values of a and b, are

(A) $a\in R$, b $\in$ (sic)
(B) $a=1, b\in R$
(C) $a\in R, b=2$
(D) $a=1$ and $b=2$

Answer: (B) $a=1, b\in R$ · Key from source paper

Q274 AIEEE 2004 MCQ

Let $f(x)=\frac{1-\tan x}{4x-\pi}$, $x\neq\frac{\pi}{4}$, $x\in\left[0,\frac{\pi}{2}\right]$. If $f(x)$ is continuous in $\left[0,\frac{\pi}{2}\right]$, then $f\left(\frac{\pi}{4}\right)$ is

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

Answer: (C) $-\frac{1}{2}$ · Key from source paper

Q275 AIEEE 2003 MCQ

If $\lim_{x\to 0}\frac{\log(3+x)-\log(3-x)}{x}=k$, the value of k is

(A) $-\frac{2}{3}$
(B) 0
(C) $-\frac{1}{3}$
(D) $\frac{2}{3}$

Answer: (D) $\frac{2}{3}$ · Key from source paper

Q276 AIEEE 2003 MCQ

Let f(a) = g(a) = k and their nth derivatives $f^n(a)$, $g^n(a)$ exist and are not equal for some n. Further if $\lim_{x\to a}\frac{f(a)g(x)-f(a)-g(a)f(x)+f(a)}{g(x)-f(x)}=4$ then the value of k is

(A) 0
(B) 4
(C) 2
(D) 1

Answer: (B) 4 · Key from source paper

Q277 AIEEE 2003 MCQ

$\lim_{x\to\frac{\pi}{2}}\frac{\left[1-\tan\left(\frac{x}{2}\right)\right][1-\sin x]}{\left[1+\tan\left(\frac{x}{2}\right)\right][\pi-2x^3]}$ is

(A) ∞
(B) $\frac{1}{8}$
(C) 0
(D) $\frac{1}{32}$

Answer: (D) $\frac{1}{32}$ · Key from source paper

Q278 AIEEE 2003 MCQ

If $f(x)=\begin{cases} xe^{-\left(\frac{1}{|x|}+\frac{1}{x}\right)}, & x\neq 0 \\ 0 & ,x=0 \end{cases}$ then $f(x)$ is

(A) discontinuous every where
(B) continuous as well as differentiable for all x
(C) continuous for all x but not differentiable at $x = 0$
(D) neither differentiable nor continuous at $x = 0$

Answer: (C) continuous for all x but not differentiable at $x = 0$ · Key from source paper

Q279 AIEEE 2003 MCQ

The value of $\lim_{x\to 0} \frac{\int_0^{x^2} \sec^2 t\, dt}{x \sin x}$ is

(A) 0
(B) 3
(C) 2
(D) 1

Answer: (D) 1 · Key from source paper

Q280 AIEEE 2002 MCQ

$\lim_{x\to 0} \frac{\sqrt{1-\cos 2x}}{\sqrt{2}\, x}$ is

(A) 1
(B) -1
(C) zero
(D) does not exist

Answer: (D) does not exist · Checked by our team

Q281 AIEEE 2002 MCQ

$\lim_{x\to\infty} \left(\frac{x^2+5x+3}{x^2+x+3}\right)^{\frac{1}{x}}$

(A) e^4
(B) e^2
(C) e^3
(D) 1

Answer: (D) 1 · Key from source paper

Q282 AIEEE 2002 MCQ

Let $f(2) = 4$ and $f'(2) = 4$. Then $\lim_{x\to 2} \frac{xf(2) - 2f(x)}{x-2}$ is given by

EdLoop JEE

(A) 2
(B) -2
(C) -4
(D) 3

Answer: (C) -4 · Key from source paper

Q283 AIEEE 2002 MCQ

$\lim_{x\to 0} \frac{\log x^n - [x]}{[x]}$, n ∈ N([x] denotes greatest integer less than or equal to x)

(A) has value -1
(B) has value 0
(C) has value 1
(D) does not exist

Answer: (D) does not exist · Key from source paper

Q284 AIEEE 2002 MCQ

If $f(1) = 1, f'(1) = 2$, then $\lim_{x\to 1} \frac{\sqrt{f(x)} - 1}{\sqrt{x} - 1}$ is

(A) 2
(B) 4
(C) 1
(D) 1/2

Answer: (A) 2 · Key from source paper

Q285 AIEEE 2002 MCQ

f is defined in [-5, 5] as f(x) = x if x is rational and = -x is irrational. Then

(A) f(x) is continuous at every x, except x = 0
(B) f(x) is discontinuous at every x, except x = 0
(C) f(x) is continuous everywhere
(D) f(x) is discontinuous everywhere

Answer: (B) f(x) is discontinuous at every x, except x = 0 · Key from source paper

EdLoop JEE