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MATHEMATICS · JEE MAIN

Differentiation

Previous Year Questions with answers

107 questions · **90** papers · **2002–2026** · newest paper first

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What is in this PDF: every Differentiation 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.

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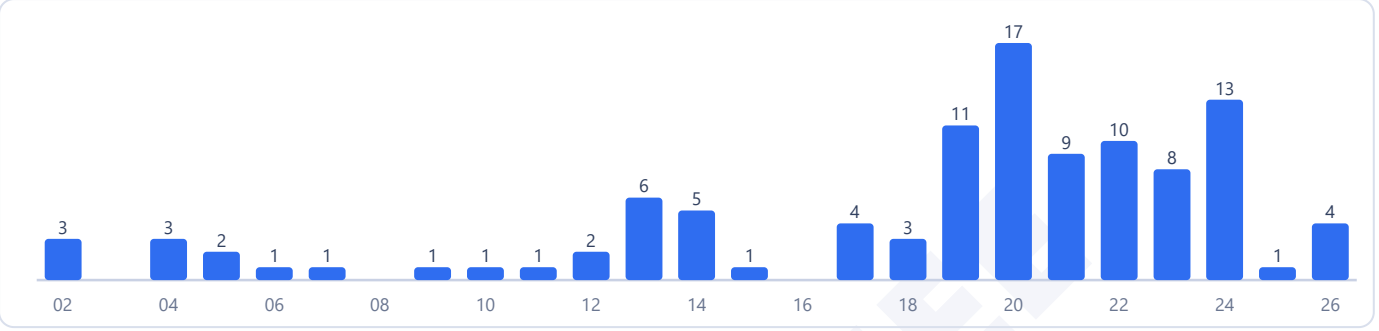
Chapter at a glance

1.6%	107	65 of 162	94 / 13
of Mathematics questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Falling: 0.3 questions per paper in 2024–2026 against 0.5 in 2019–2023.

Questions per year



Counts are the questions we hold: 107 in 90 papers. No question in this chapter was found repeated across papers.

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

Methods of Differentiation	41
Higher Order Derivatives	39
Mean Value Theorems	27

How often it comes up

Differentiation provides the operative techniques across calculus under Unit 7: Limit, Continuity and Differentiability in the Class 12 curriculum, occupying rank 26 among the 29 chapters in the subject. Between 2019 and 2026, this chapter contributed 73 questions across 162 papers, representing 1.6 percent of all mathematics questions. It appeared in 65 of those papers and has been featured every year since 2019. In the recent 2024 to 2026 examination cycle, it supplied 18 questions across 58 papers, averaging 0.3 questions per paper with a 1.2 percent subject share. Comparing the 2002 to 2018 window share of 2.6 percent to the 2024 to 2026 share shows that its long-term presence is down, whereas comparing 2019 to 2026 against 2024 to 2026 shows it is about the same. Across all 200 papers from 2002 to 2026, 107 questions were asked in 90 test sessions. Among the questions from 2019 to 2026, 13 were numerical answer questions.

Direct differentiation questions appear in approximately one out of every two examination papers. The annual figures across 2024, 2025, and 2026 were 13, 1, and 4 questions respectively.

While rank 26 indicates a comparatively modest standalone presence, differentiation is a vital computational engine for applications of derivatives, differential equations, and definite integrals. Examiners often nest differentiation within functional equations or inverse function evaluations rather than asking for straightforward derivatives.

Most-asked topics

Questions in this chapter concentrate in three specific areas:

1. **Higher Order Derivatives (29 questions, 2019-2026; 39 total, last asked 2026)** The most common question type involves evaluating second or third derivatives of implicit functions, parametric representations, or polynomials satisfying specific boundary equations. Several questions involve establishing recurrence relations or differential relations between successive derivatives.

2. **Methods of Differentiation (27 questions, 2019-2026; 41 total, last asked 2026)** Covers logarithmic differentiation of complicated products or variable bases, differentiation of inverse trigonometric functions, and derivatives of inverse functions. Examiners test algebraic simplification prior to differentiating to avoid excessive computation.

3. **Mean Value Theorems (17 questions, 2019-2026; 27 total, last asked 2024)** Focuses on Rolle's theorem and Lagrange's Mean Value Theorem. Problems test existence of roots for derived functions, establishing intervals where derivatives vanish, or bounding differences using mean value inequalities. Note that Rolle's and Lagrange's theorems were trimmed from the most recent NTA syllabus.

What the questions look like

Standalone differentiation problems in recent sessions showcase distinct styles:

- **Polynomial Coefficient Matching**: A polynomial function has coefficients defined in terms of its own successive derivatives evaluated at small integer inputs. Differentiating repeatedly allows you to set up and solve a small linear system for the unknown coefficients.
- **Inverse Trigonometric Simplification**: A composite expression involving sums of inverse tangents or inverse sines simplifies to a clean linear or algebraic form via trigonometric substitutions before differentiation.
- **Derivative of an Inverse Function**: Given an invertible function defined implicitly or exponentially, you evaluate the derivative of its inverse without finding the explicit inverse formula, relying on the reciprocal relation of derivatives.
- **Parametric Second Derivative**: Two variables are expressed in terms of an auxiliary parameter. Calculating the second derivative requires applying the chain rule correctly to the derivative of the parameter with respect to the independent variable.

How to practise it

Efficient differentiation balances algebraic foresight with systematic execution:

- **Simplify before applying rules**: Never rush into quotient or product rules if the expression can be rewritten. Factoring, decomposing via logarithms, or applying trigonometric identities can turn an unwieldy expression into basic power terms.
- **Handle parametric second derivatives methodically**: When computing the second derivative of y with respect to x from parametric expressions, differentiate the first derivative with respect to the parameter, then multiply by the reciprocal of dx over dt. Omitting this final factor is one of the most frequent traps.
- **Apply logarithmic differentiation for exponents**: When both base and exponent vary with the independent variable, take natural logarithms on both sides before executing the derivative. Differentiating directly while treating one component as constant is an invalid shortcut.
- **Use reciprocal properties for inverse functions**: When evaluating the derivative of the inverse function g at a point, identify the input that maps to that point under the original function f, then compute the reciprocal of f prime at that input.

Q1 JEE Main 2026 · 5 Apr · Shift 2 MCQ

Let $f(x)$ and $g(x)$ be twice differentiable functions satisfying $f''(x) = g''(x)$ for all $x \in \mathbf{R}$, $f'(1) = 2g'(1) = 4$ and $g(2) = 3f(2) = 9$. Then $f(25) - g(25)$ is equal to :

(A) 20
(B) 40
(C) -20
(D) -40

Answer: (B) 40 · Official NTA final key

Q2 JEE Main 2026 · 4 Apr · Shift 1 MCQ

If $y = \tan^{-1}\left(\frac{3\cos x - 4\sin x}{4\cos x + 3\sin x}\right) + 2\tan^{-1}\left(\frac{x}{1+\sqrt{1-x^2}}\right)$, then $\frac{dy}{dx}$ at $x = \frac{\sqrt{3}}{2}$ is equal to:

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

Answer: (C) 1 · Official NTA final key

Q3 JEE Main 2026 · 4 Apr · Shift 1 MCQ

Let f be a real polynomial of degree n such that $f(x) = f'(x)\, f''(x)$, for all $x \in \mathrm{R}$. If $f(0) = 0$, then $36\left(f'(2) + f''(2) + \int_0^2 f(x)dx\right)$ is equal to:

(A) 42
(B) 46
(C) 56
(D) 66

Answer: (C) 56 · Official NTA final key

Q4 JEE Main 2026 · 21 Jan · Shift 2 MCQ

Let $f(x) = x^3 + x^2 f'(1) + 2x f''(2) + f'''(3)$, $x \in \mathbf{R}$. Then the value of $f'(5)$ is :

(A) $\frac{62}{5}$
(B) $\frac{657}{5}$
(C) $\frac{2}{5}$
(D) $\frac{117}{5}$

Answer: (D) $\frac{117}{5}$ · Official NTA final key

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Q5 JEE Main 2025 · 2 Apr · Shift 1 Numerical

Let $f : R \to R$ be a thrice differentiable odd function satisfying $f'(x) \geq 0, f''(x) = f(x), f(0) = 0, f'(0) = 3$. Then $9f(\log_e 3)$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 36. · Key from source paper

Q6 JEE Main 2024 · 9 Apr · Shift 1 MCQ

Let $f(x) = ax^3 + bx^2 + cx + 41$ be such that $f(1) = 40$, $f'(1) = 2$ and $f''(1) = 4$. Then $\mathrm{a}^2 + \mathrm{b}^2 + \mathrm{c}^2$ is equal to:

(A) 73
(B) 62
(C) 51
(D) 54

Answer: (C) 51 · Key from source paper

Q7 JEE Main 2024 · 9 Apr · Shift 2 MCQ

If $\log_e y = 3\sin^{-1} x$, then $(1 - x^2)y'' - xy'$ at $x = \frac{1}{2}$ is equal to

(A) $3e^{\pi/6}$
(B) $9e^{\pi/2}$
(C) $3e^{\pi/2}$
(D) $9e^{\pi/6}$

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

Q8 JEE Main 2024 · 6 Apr · Shift 1 MCQ

If $f(x) = \begin{cases} x^3 \sin\left(\frac{1}{x}\right), x \neq 0 \\ 0 \quad , x = 0 \end{cases}$ then

(A) $f''\left(\frac{2}{\pi}\right) = \frac{24-\pi^2}{2\pi}$
(B) $f''\left(\frac{2}{\pi}\right) = \frac{12-\pi^2}{2\pi}$
(C) $f''(0) = 1$
(D) $f''(0) = 0$

Answer: (A) $f''\left(\frac{2}{\pi}\right) = \frac{24-\pi^2}{2\pi}$ · Key from source paper

Q9 JEE Main 2024 · 6 Apr · Shift 2 MCQ

Suppose for a differentiable function h, $h(0) = 0$, $h(1) = 1$ and $h'(0) = h'(1) = 2$. If $g(x) = h\left(e^x\right)e^{h(x)}$, then $g'(0)$ is equal to:

(A) 5
(B) 4
(C) 8
(D) 3

Answer: (B) 4 · Key from source paper

Q10 JEE Main 2024 · 5 Apr · Shift 1 MCQ

Let $f(x) = x^5 + 2x^3 + 3x + 1, x \in \mathbf{R}$, and $g(x)$ be a function such that $g(f(x)) = x$ for all $x \in \mathbf{R}$. Then $\frac{g(7)}{g'(7)}$ is equal to :

(A) 14
(B) 42
(C) 7
(D) 1

Answer: (A) 14 · Key from source paper

Q11 JEE Main 2024 · 5 Apr · Shift 2 MCQ

If $y(\theta) = \frac{2\cos\theta + \cos 2\theta}{\cos 3\theta + 4\cos 2\theta + 5\cos\theta + 2}$, then at $\theta = \frac{\pi}{2}$, $y'' + y' + y$ is equal to :

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

Answer: (C) 2 · Key from source paper

Q12 JEE Main 2024 · 4 Apr · Shift 1 MCQ

Let $f(x) = x^5 + 2e^{x/4}$ for all $x \in \mathbf{R}$. Consider a function $g(x)$ such that $(g \circ f)(x) = x$ for all $x \in \mathbf{R}$. Then the value of $8g'(2)$ is :

(A) 2
(B) 8
(C) 4
(D) 16

Answer: (D) 16 · Key from source paper

Q13 JEE Main 2024 · 4 Apr · Shift 2 Numerical

Let $f : \mathbb{R} \to \mathbb{R}$ be a thrice differentiable function such that $f(0) = 0, f(1) = 1, f(2) = -1, f(3) = 2$ and $f(4) = -2$. Then, the minimum number of zeros of $(3f'f'' + ff''')(x)$ is _____

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q14 JEE Main 2024 · 1 Feb · Shift 2 Numerical

If $y = \frac{\sqrt{x}+1x^2-\sqrt{x}}{x\sqrt{x}+x+\sqrt{x}} + \frac{1}{15}3\cos^2 x - 5\cos^3 x$, then $96y'\frac{\pi}{6}$ is equal to:

Numerical value type: the answer is a number.

Answer: 105. · Key from source paper

Q15 JEE Main 2024 · 30 Jan · Shift 1 MCQ

Let $g : R \to R$ be a non constant twice differentiable such that $g'\left(\frac{1}{2}\right) = g'\left(\frac{3}{2}\right)$. If a real valued function f is defined as $f(x) = \frac{1}{2}\left[g(x) + g(2-x)\right]$, then

(A) $f''(x) = 0$ for atleast two x in $(0, 2)$
(B) $f''(x) = 0$ for exactly one x in $(0, 1)$
(C) $f''(x) = 0$ for no x in $(0, 1)$
(D) $f'\left(\frac{3}{2}\right) + f'\left(\frac{1}{2}\right) = 1$

Answer: (A) $f''(x) = 0$ **for atleast two** x **in** $(0, 2)$ · Key from source paper

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Q16 JEE Main 2024 · 29 Jan · Shift 1 MCQ

Suppose $f(x) = \frac{\left(2^x+2^{-x}\right)\tan x\sqrt{\tan^{-1}(x^2-x+1)}}{(7x^2+3x+1)^3}$. Then the value of $f'(0)$ is equal to

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

Answer: (C) $\sqrt{\pi}$ · Key from source paper

Q17 JEE Main 2024 · 29 Jan · Shift 2 MCQ

Let $y = \log_e\left(\frac{1-x^2}{1+x^2}\right), -1 < x < 1$. Then at $x = \frac{1}{2}$, the value of $225(y' - y'')$ is equal to

(A) 732
(B) 746
(C) 742
(D) 736

Answer: (D) 736 · Key from source paper

Q18 JEE Main 2024 · 27 Jan · Shift 1 Numerical

Let $f(x) = x^3 + x^2 f'(1) + xf''(2) + f'''(3), x \in R$. Then $f'(10)$ is equal to

Numerical value type: the answer is a number.

Answer: 202. · Key from source paper

Q19 JEE Main 2023 · 8 Apr · Shift 1 MCQ

Let $f(x)=\frac{\sin x+\cos x-\sqrt{2}}{\sin x-\cos x}$, $x\in[0,\pi]-\left\{\frac{\pi}{4}\right\}$, then $f\left(\frac{7\pi}{12}\right)f''\left(\frac{7\pi}{12}\right)$ is equal to

(A) $\frac{2}{9}$
(B) $\frac{-2}{3}$
(C) $\frac{-1}{3\sqrt{3}}$
(D) $\frac{2}{3\sqrt{3}}$

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

Q20 JEE Main 2023 · 6 Apr · Shift 1 MCQ

If $2x^y+3y^x=20$, then $\frac{dy}{dx}$ at $2,2$ is equal to:

(A) $-\frac{2+\log_e 8}{3+\log_e 4}$
(B) $-\frac{3+\log_e 16}{4+\log_e 8}$
(C) $-\frac{3+\log_e 8}{2+\log_e 4}$
(D) $-\frac{3+\log_e 4}{2+\log_e 8}$

Answer: (A) $-\frac{2+\log_e 8}{3+\log_e 4}$ · Key from source paper

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Q21 JEE Main 2023 · 1 Feb · Shift 1 Numerical

If $fx=x^2+g'1x+g''2$ and $gx=f1x^2+xf'x+f''x$, then the value of $f4-g4$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 14. · Key from source paper

Q22 JEE Main 2023 · 1 Feb · Shift 2 MCQ

If $y(x)=x^x, x>0$, then $y''(2)-2y'(2)$ is equal to :

(A) $8\log_e 2-2$
(B) $4\log_e 2+2$
(C) $4(\log_e 2)^2-2$
(D) $4(\log_e 2)^2+2$

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

Q23 JEE Main 2023 · 31 Jan · Shift 1 MCQ

Let $y=fx=\sin^3\frac{\pi}{3}\cos\frac{\pi}{3\sqrt{2}}-4x^3+5x^2+1^{\frac{3}{2}}$. Then, at $x=1$,

(A) $2y' + \sqrt{3}\pi^2 y = 0$
(B) $2y' + 3\pi^2 y = 0$
(C) $\sqrt{2}y' - 3\pi^2 y = 0$
(D) $y' + 3\pi^2 y = 0$

Answer: (B) $2y' + 3\pi^2 y = 0$ · Key from source paper

Q24 JEE Main 2023 · 29 Jan · Shift 2 MCQ

Let f and g be twice differentiable functions on R such that
$f''(x) = g''(x) + 6x$
$f'(1) = 4g'(1) - 3 = 9$
$f(2) = 3\ g(2) = 12$
Then which of the following is NOT true ?

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

Answer: (B) If $-1 < x < 2$, then $|f(x) - g(x)| < 8$ · Key from source paper

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Q25 JEE Main 2023 · 25 Jan · Shift 1 MCQ

Let $y(x) = (1+x)\left(1+x^2\right)\left(1+x^4\right)\left(1+x^8\right)\left(1+x^{16}\right)$. Then $y' - y''$ at $x = -1$ is equal to

(A) 976
(B) 464
(C) 496
(D) 944

Answer: (C) 496 · Key from source paper

Q26 JEE Main 2023 · 24 Jan · Shift 2 MCQ

If $f(x) = x^3 - x^2 f'(1) + x f''(2) - f'''(3)$, $x \in \mathbb{R}$, then

(A) $3f(1) + f(2) = f(3)$
(B) $f(3) - f(2) = f(1)$
(C) $2f(0) - f(1) + f(3) = f(2)$
(D) $f(1) + f(2) + f(3) = f(0)$

Answer: (C) $2f(0) - f(1) + f(3) = f(2)$ · Key from source paper

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Q27 JEE Main 2022 · 28 Jul · Shift 1 Numerical

Let $f : 0, 1 \to R$ be a twice differentiable function in $0, 1$ such that $f0 = 3$ and $f1 = 5$. If the line $y = 2x + 3$ intersects the graph of f at only two distinct points in $0, 1$, then the least number of points

$x \in 0, 1$, at which $f''x = 0$, is

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q28 JEE Main 2022 · 28 Jul · Shift 2 MCQ

Let $x(t) = 2\sqrt{2}\cos t\sqrt{\sin 2t}$ and $y(t) = 2\sqrt{2}\sin t\sqrt{\sin 2t}, t \in \left(0, \frac{\pi}{2}\right)$. Then $\frac{1+\left(\frac{dy}{dx}\right)^2}{\frac{d^2y}{dx^2}}$ at $t = \frac{\pi}{4}$ is equal to

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

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

Q29 JEE Main 2022 · 27 Jul · Shift 2 Numerical

For the curve $C : (x^2 + y^2 - 3) + (x^2 - y^2 - 1)^5 = 0$, the value of $3y' - y^3y''$, at the point (α, α), $\alpha > 0$, on C, is equal to _____ .

Numerical value type: the answer is a number.

Answer: 16. · Key from source paper

Q30 JEE Main 2022 · 26 Jul · Shift 2 MCQ

The value of $\log_e 2\frac{\mathrm{d}}{\mathrm{dx}}\log_{\cos x}\operatorname{cosec} x$ at $x = \frac{\pi}{4}$ is

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

Answer: (D) 4 · Key from source paper

Q31 JEE Main 2022 · 29 Jun · Shift 2 Numerical

Let f and g be twice differentiable even functions on $(-2,\ 2)$ such that $f\left(\frac{1}{4}\right) = 0$, $f\left(\frac{1}{2}\right) = 0$, $f(1) = 1$ and $g\left(\frac{3}{4}\right) = 0$, $g(1) = 2$ Then, the minimum number of solutions of $f(x)g''(x) + f'(x)g'(x) = 0$ in $(-2,\ 2)$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q32 JEE Main 2022 · 27 Jun · Shift 1 MCQ

If $\cos^{-1}\left(\frac{y}{2}\right) = \log_e\left(\frac{x}{5}\right)^5$, $|y| < 2$, then

(A) $x^2y'' + xy' - 25y = 0$
(B) $x^2y'' - xy' - 25y = 0$
(C) $x^2y'' - xy' + 25y = 0$
(D) $x^2y'' + xy' + 25y = 0$

Answer: (D) $x^2y'' + xy' + 25y = 0$ · Key from source paper

Q33 JEE Main 2022 · 27 Jun · Shift 2 Numerical

If $y(x) = (x^x)^x,\ x > 0$ then $\frac{d^2x}{dy^2} + 20$ at $x = 1$ is equal to

Numerical value type: the answer is a number.

Answer: 16. · Key from source paper

Q34 JEE Main 2022 · 25 Jun · Shift 1 MCQ

Let fx be a polynomial function such that $fx + f'x + f''x = x^5 + 64$. Then, the value of $\lim_{x\to 1} \frac{fx}{x-1}$ is equal to

(A) -15
(B) 15
(C) -60
(D) 60

Answer: (A) -15 · Key from source paper

Q35 JEE Main 2022 · 25 Jun · Shift 1 MCQ

Let $f : R \to R$ be defined as $fx = x^3 + x - 5$. If gx is a function such that $fgx = x, \forall x \in R$, then $g'63$ is equal to

(A) 49
(B) $\frac{1}{49}$
(C) $\frac{43}{49}$
(D) $\frac{3}{49}$

Answer: (B) $\frac{1}{49}$ · Key from source paper

Q36 JEE Main 2022 · 24 Jun · Shift 2 MCQ

If $y = \tan^{-1}\left(\sec x^3 - \tan x^3\right),\ \frac{\pi}{2} < x^3 < \frac{3\pi}{2}$, then

(A) $xy'' + 2y' = 0$
(B) $x^2y'' - 6y + \frac{3\pi}{2} = 0$
(C) $x^2y'' - 6y + 3\pi = 0$
(D) $xy'' - 4y' = 0$

Answer: (B) $x^2y'' - 6y + \frac{3\pi}{2} = 0$ · Key from source paper

Q37 JEE Main 2021 · 1 Sep · Shift 2 MCQ

The function $fx = x^3 - 6x^2 + ax + b$ is such that $f2 = f4 = 0$.
Consider two statements:
S_1 there exists $x_1, x_2 \in 2, 4$, $x_1 < x_2$, such that $f'x_1 = -1$ and $f'x_2 = 0$.
S_2 there exists $x_3, x_4 \in 2, 4$, $x_3 < x_4$, such that f is decreasing in $2, x_4$, increasing in $x_4, 4$ and $2f'x_3 = \sqrt{3}fx_4$ then

(A) S_1 is true and S_2 is false
(B) both S_1 and S_2 are false
(C) both S_1 and S_2 are true
(D) S_1 is false and S_2 is true

Answer: (C) both S_1 and S_2 are true · Key from source paper

Q38 JEE Main 2021 · 31 Aug · Shift 2 MCQ

Let f be any continuous function on $0, 2$ and twice differentiable on $0, 2$. If $f0 = 0$, $f1 = 1$ and $f2 = 2$, then :

(A) $f''x > 0$ for all $x \in 0, 2$
(B) $f'x = 0$ for some $x \in 0, 2$
(C) $f''x = 0$ for some $x \in 0, 2$
(D) $f''x = 0$ for all $x \in 0, 2$

Answer: (C) $f''x = 0$ for some $x \in 0, 2$ · Key from source paper

Q39 JEE Main 2021 · 27 Aug · Shift 1 Numerical

If $y^{1/4} + y^{-1/4} = 2x$, and $(x^2 - 1)\frac{d^2y}{dx^2} + \alpha x\frac{dy}{dx} + \beta y = 0$, then $|\alpha - \beta|$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 17. · Key from source paper

Q40 JEE Main 2021 · 26 Aug · Shift 1 Numerical

If $y = y(x)$ is an implicit function of x such that $\log_e(x + y) = 4xy$, then $\frac{d^2y}{dx^2}$ at $x = 0$ is equal to

Numerical value type: the answer is a number.

Answer: 40. · Key from source paper

Q41 JEE Main 2021 · 27 Jul · Shift 2 MCQ

Let $f:(a,b)\to R$ be twice differentiable function such that $f(x)=\int_a^x g(t)dt$ for a differentiable function $g(x)$. If $f(x)=0$ has exactly five distinct roots in (a,b), then $g(x)g'(x)=0$ has at least :

(A) twelve roots in (a,b)
(B) five roots in (a,b)
(C) seven roots in (a,b)
(D) three roots in (a,b)

Answer: (C) seven roots in (a,b) · Key from source paper

Q42 JEE Main 2021 · 17 Mar · Shift 1 Numerical

If $f(x)=\sin\left(\cos^{-1}\left(\frac{1-2^{2x}}{1+2^{2x}}\right)\right)$ and its first derivative with respect to x is $-\frac{b}{a}\log_e 2$ when $x=1$, where a and b are integers, then the minimum value of $\left|a^2-b^2\right|$ is _____.

Numerical value type: the answer is a number.

Answer: 481. · Key from source paper

Q43 JEE Main 2021 · 16 Mar · Shift 2 MCQ

Let $f:S\to S$ where $S=(0,\infty)$ be a twice differentiable function such that $f(x+1)=xf(x)$. If $g:S\to R$ be defined as $g(x)=\log_e f(x)$, then the value of $|g''(5)-g''(1)|$ is equal to :

(A) $\frac{205}{144}$
(B) $\frac{197}{144}$
(C) $\frac{187}{144}$
(D) 1

Answer: (A) $\frac{205}{144}$ · Key from source paper

Q44 JEE Main 2021 · 25 Feb · Shift 1 MCQ

If Rolle's theorem holds for the function $f(x)=x^3-ax^2+bx-4, x\in[1,2]$ with $f'\left(\frac{4}{3}\right)=0$, then ordered pair (a,b) is equal to :

(A) $(-5,-8)$
(B) $(-5,8)$
(C) $(5,8)$
(D) $(5,-8)$

Answer: (C) $(5,8)$ · Key from source paper

Q45 JEE Main 2021 · 24 Feb · Shift 2 MCQ

Let f be a twice differentiable function defined on R such that $f(0)=1$, $f'(0)=2$ and $f'(x)\neq 0$ for all $x\in R$. If $\begin{vmatrix} f(x) & f'(x) \\ f'(x) & f''(x) \end{vmatrix}=0$, for all $x\in R$, then the value of $f(1)$ lies in the interval

(A) $(9,12)$
(B) $(3,6)$
(C) $(0,3)$
(D) $(6,9)$

Answer: (D) $(6,9)$ · Key from source paper

Q46 JEE Main 2020 · 6 Sep · Shift 1 MCQ

The position of a moving car at time t is given by $f(t)=at^2+bt+c,\ t>0$, where $a,\ b$ and c are real numbers greater than 1. Then the average speed of the car over the time interval $[t_1,t_2]$ is attained at the point:

(A) $\frac{(t_2-t_1)}{2}$
(B) $a(t_2-t_1)+b$
(C) $\frac{(t_1+t_2)}{2}$
(D) $2a(t_1+t_2)+b$

Answer: (C) $\frac{(t_1+t_2)}{2}$ · Key from source paper

Q47 JEE Main 2020 · 6 Sep · Shift 2 MCQ

For all twice differentiable functions $f:\mathbf{R}\to\mathbf{R}$, with $f(0)=f(1)=f'(0)=0$,

(A) $f''(x)\neq 0$ at every point $x\varepsilon(0,1)$
(B) $f''(x)=0$, for some $x\ \varepsilon\ (0,1)$
(C) $f''(0)=0$
(D) $f''(x)=0$, at every point $x\ \varepsilon\ (0,1)$

Answer: (B) $f''(x)=0$, for some $x\ \varepsilon\ (0,1)$ · Checked by our team

Q48 JEE Main 2020 · 6 Sep · Shift 2 MCQ

If the tangent to the curve,$y=f(x)=x\ \log_e x,\ (x>0)$ at a point $(c,\ f(c))$ is parallel to the line-segment joining the points $(1,\ 0)$ and $(e,\ e)$,then c is equal to :

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

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

Q49 JEE Main 2020 · 5 Sep · Shift 2 MCQ

The derivative of $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with respect to $\tan^{-1}\left(\frac{2x\sqrt{1-x^2}}{1-2x^2}\right)$ at $x=\frac{1}{2}$ is :

(A) $\frac{2\sqrt{3}}{5}$
(B) $\frac{\sqrt{3}}{12}$
(C) $\frac{2\sqrt{3}}{3}$
(D) $\frac{\sqrt{3}}{10}$

Answer: (D) $\frac{\sqrt{3}}{10}$ · Key from source paper

Q50 JEE Main 2020 · 4 Sep · Shift 1 MCQ

If $\left(a+\sqrt{2}b\cos x\right)\left(a-\sqrt{2}b\cos y\right)=a^2-b^2$, where $a>b>0$, then $\frac{dx}{dy}$ at $\left(\frac{\pi}{4},\frac{\pi}{4}\right)$ is:

(A) $\frac{a-2b}{a+2b}$
(B) $\frac{a-b}{a+b}$
(C) $\frac{a+b}{a-b}$
(D) $\frac{2a+b}{2a-b}$

Answer: (C) $\frac{a+b}{a-b}$ · Key from source paper

Q51 JEE Main 2020 · 4 Sep · Shift 1 MCQ

Let f be a twice differentiable function on $(1,6)$. If $f(2)=8$, $f'(2)=5$, $f'(x)\geq 1$ and $f''(x)\geq 4$, for all $x\in(1,6)$, then :

(A) $f(5)+f'(5)\leq 26$
(B) $f(5)+f'(5)\geq 28$
(C) $f'(5)+f''(5)\leq 20$
(D) $f(5)\leq 10$

Answer: (B) $f(5)+f'(5)\geq 28$ · Key from source paper

Q52 JEE Main 2020 · 3 Sep · Shift 1 MCQ

If $y^2+\log_e(\cos^2 x)=y,\ x\in\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ then :

(A) $y''(0)=0$
(B) $|y'(0)|+|y''(0)|=1$
(C) $|y''(0)|=2$
(D) $|y'(0)|+|y''(0)|=3$

Answer: (C) $|y''(0)|=2$ · Key from source paper

Q53 JEE Main 2020 · 2 Sep · Shift 2 Numerical

If $y=\sum_{k=1}^{6}k\cos^{-1}\left\{\frac{3}{5}\cos kx-\frac{4}{5}\sin kx\right\}$ then $\frac{dy}{dx}$ at $x=0$is

Numerical value type: the answer is a number.

Answer: 91. · Key from source paper

Q54 JEE Main 2020 · 9 Jan · Shift 1 MCQ

Let f be any function continuous on $[a, b]$ and twice differentiable on (a, b) . If all $x \in (a, b)$, $f'(x) > 0$ and $f''(x) < 0$, then for any $c \in (a, b)$, $\frac{f(c)-f(a)}{f(b)-f(c)}$ is greater than

(A) $\frac{b+a}{b-a}$

(B) 1

(C) $\frac{b-c}{c-a}$

(D) $\frac{c-a}{b-c}$

Answer: (D) $\frac{c-a}{b-c}$ · Key from source paper

Q55 JEE Main 2020 · 9 Jan · Shift 2 MCQ

If $x = 2\sin\theta - \sin 2\theta$ and $y = 2\cos\theta - \cos 2\theta$, $\theta \in [0, 2\pi]$, then $\frac{d^2y}{dx^2}$ at $\theta = \pi$ is:

(A) $\frac{3}{4}$

(B) $\frac{3}{8}$

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

(D) $-\frac{3}{4}$

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

Q56 JEE Main 2020 · 9 Jan · Shift 2 MCQ

Let f and g be differentiable functions on R such that fog is the identity function. If for some $a, b \in R$, $g'(a) = 5$ and $g(a) = b$, then $f'(b)$ is equal to:

(A) $\frac{1}{5}$

(B) 1

(C) 5

(D) $\frac{2}{5}$

Answer: (A) $\frac{1}{5}$ · Key from source paper

Q57 JEE Main 2020 · 8 Jan · Shift 1 MCQ

If c is a point at which Rolle's theorem holds for the function, $f(x) = \log_e\left(\frac{x^2+\alpha}{7x}\right)$ in the interval $[3, 4]$, where $\alpha \in R$, then $f''(c)$ is equal to

(A) $-\frac{1}{12}$
(B) $\frac{1}{12}$
(C) $-\frac{1}{24}$
(D) $\frac{\sqrt{3}}{7}$

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

Q58 JEE Main 2020 · 7 Jan · Shift 1 MCQ

If $y(\alpha)=\sqrt{2\left(\frac{\tan\alpha+\cot\alpha}{1+\tan^2\alpha}\right)+\frac{1}{\sin^2\alpha}}$, $\alpha\in\left(\frac{3\pi}{4},\pi\right)$, then $\frac{dy}{d\alpha}$ at $\alpha=\frac{5\pi}{6}$ is

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

Answer: (A) 4 · Key from source paper

Q59 JEE Main 2020 · 7 Jan · Shift 1 MCQ

Let $x^k+y^k=a^k$, $(a,k>0)$ and $\frac{dy}{dx}+\left(\frac{y}{x}\right)^{\frac{1}{3}}=0$, then k is

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

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

Q60 JEE Main 2020 · 7 Jan · Shift 1 MCQ

Let the function , $f:[-7,0]\to R$ be continuous on $[-7,0]$ and differentiable on $(-7,0)$. If $f(-7)=-3$ and $f'(x)\le 2$ for all $x\in(-7,0)$, then for all such functions f, $f(-1)+f(0)$ lies in the interval

(A) $(-\infty,20]$
(B) $[-3,11]$
(C) $(-\infty,11]$
(D) $[-6,20]$

Answer: (A) $(-\infty,20]$ · Key from source paper

Q61 JEE Main 2020 · 7 Jan · Shift 2 MCQ

Let $y=y(x)$ be a function of x satisfying $y\sqrt{1-x^2}=k-x\sqrt{1-y^2}$ where k is a constant and $y\left(\frac{1}{2}\right)=-\frac{1}{4}$. Then $\frac{dy}{dx}$ at $x=\frac{1}{2}$, is equal to

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

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

Q62 JEE Main 2020 · 7 Jan · Shift 2 MCQ

The value of c, in the Lagrange's mean value theorem for the function $f(x) = x^3 - 4x^2 + 8x + 11$, when $x \in [0, 1]$, is

(A) $\frac{4-\sqrt{5}}{3}$
(B) $\frac{4-\sqrt{7}}{3}$
(C) $\frac{2}{3}$
(D) $\frac{\sqrt{7}-2}{3}$

Answer: (B) $\frac{4-\sqrt{7}}{3}$ · Key from source paper

Q63 JEE Main 2019 · 12 Apr · Shift 1 MCQ

If $e^y + xy = e$, the ordered pair $\left(\frac{dy}{dx}, \frac{d^2y}{dx^2}\right)$ at $x = 0$ is equal to

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

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

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Q64 JEE Main 2019 · 12 Apr · Shift 2 MCQ

The derivative of $\tan^{-1}\left(\frac{\sin x - \cos x}{\sin x + \cos x}\right)$ with respect to $\frac{x}{2}$, where $x \in \left(0, \frac{\pi}{2}\right)$, is

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

Answer: (A) 2 · Key from source paper

Q65 JEE Main 2019 · 10 Apr · Shift 2 MCQ

Let $fx = \log_e \sin x,\ 0 < x < \pi$ and $gx = \sin^{-1}\left(e^{-x}\right),\ (x \geq 0)$. If α is a positive real number such that $a = fog'(\alpha)$ and $b = fog(\alpha)$, then

(A) $a\alpha^2 + b\alpha + a = 0$

(B) $a\alpha^2 + b\alpha - a = -2\alpha$

(C) $a\alpha^2 - b\alpha - a = 0$

(D) $a\alpha^2 - b\alpha - a = 1$

Answer: (D) $a\alpha^2 - b\alpha - a = 1$ · Key from source paper

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Q66 JEE Main 2019 · 9 Apr · Shift 1 MCQ

Let S be the set of all values of x for which the tangent to the curve $y = f(x) = x^3 - x^2 - 2x$ at (x, y) is parallel to the line segment joining the points $(1, f(1))$ and $(-1, f(-1))$, then S is equal to

(A) $\left\{-\frac{1}{3}, -1\right\}$

(B) $\left\{-\frac{1}{3}, 1\right\}$

(C) $\left\{\frac{1}{3}, 1\right\}$

(D) $\left\{\frac{1}{3}, -1\right\}$

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

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Q67 JEE Main 2019 · 8 Apr · Shift 1 MCQ

If $2y = \cot^{-1}\frac{\sqrt{3}\cos x + \sin x}{\cos x - \sqrt{3}\sin x}^2 \ \forall x \in 0, \frac{\pi}{2}$, then $\frac{dy}{dx}$ is equal to

(A) $\frac{\pi}{6} - x$

(B) $2x - \frac{\pi}{3}$

(C) $x - \frac{\pi}{6}$

(D) None of these

Answer: (D) None of these · Key from source paper

Q68 JEE Main 2019 · 8 Apr · Shift 2 MCQ

If $f1 = 1, f'1 = 3$, then the derivative of $fffx + fx^2$ at $x = 1$ is:

(A) 9

(B) 12

(C) 15

(D) 33

Answer: (D) 33 · Key from source paper

EdLoop JEE

Q69 JEE Main 2019 · 12 Jan · Shift 1 MCQ

For $x > 1$, if $(2x)^{2y} = 4e^{2x-2y}$, then $(1 + \log_e 2x)^2 \frac{dy}{dx}$ is equal to

(A) $\log_e 2x$
(B) $\frac{x \log_e 2x - \log_e 2}{x}$
(C) $x \log_e 2x$
(D) $\frac{x \log_e 2x + \log_e 2}{x}$

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

Q70 JEE Main 2019 · 12 Jan · Shift 2 MCQ

Let f be a differentiable function such that $f(1) = 2$ and $f'(x) = f(x)$ for all $x \in R$. If $h(x) = f(f(x))$, then $h'(1)$ is equal to :

(A) $4e^2$
(B) $2e$
(C) $4e$
(D) $2e^2$

Answer: (C) $4e$ · Key from source paper

Q71 JEE Main 2019 · 11 Jan · Shift 1 MCQ

If $x \log_e (\log_e x) - x^2 + y^2 = 4 (y > 0)$, then $\frac{dy}{dx}$ at $x = e$ is equal to :

(A) $\frac{(1+2e)}{2\sqrt{4+e^2}}$
(B) $\frac{(2e-1)}{2\sqrt{4+e^2}}$
(C) $\frac{(1+2e)}{\sqrt{4+e^2}}$
(D) $\frac{e}{\sqrt{4+e^2}}$

Answer: (B) $\frac{(2e-1)}{2\sqrt{4+e^2}}$ · Key from source paper

Q72 JEE Main 2019 · 10 Jan · Shift 1 MCQ

Let, $f : R \to R$ be a function such that $f(x) = x^3 + x^2 f\prime(1) + x f\prime\prime(2) + f\prime\prime\prime(3)$, $\forall x \in R$. Then $f(2)$ equals

(A) 30
(B) 8
(C) -4
(D) -2

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

Q73 JEE Main 2019 · 9 Jan · Shift 2 MCQ

If $x = 3\tan t$ and $y = 3\sec t$, then the value of $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{4}$, is:

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

Answer: (B) $\frac{1}{6\sqrt{2}}$ · Key from source paper

Q74 JEE Main 2018 · 16 Apr · Online MCQ

If $x = \sqrt{2^{\text{cosec}^{-1}t}}$ and $y = \sqrt{2^{\sec^{-1}t}}$, $(|t| \geq 1)$, then $\frac{dy}{dx}$ is equal to

(A) $\frac{y}{x}$
(B) $-\frac{y}{x}$
(C) $-\frac{x}{y}$
(D) $\frac{x}{y}$

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

Q75 JEE Main 2018 · 15 Apr · Shift 1 MCQ

If $x^2 + y^2 + \sin y = 4$, then the value of $\frac{d^2y}{dx^2}$ at the point $(-2, 0)$ is

(A) -34
(B) -32
(C) -2
(D) 4

Answer: (A) -34 · Key from source paper

Q76 JEE Main 2018 · 15 Apr · Shift 2 MCQ

If $f(x) = \sin^{-1}\left(\frac{2 \times 3^x}{1 + 9^x}\right)$, then $f'\left(-\frac{1}{2}\right)$ equals.

(A) $\sqrt{3}\log_e\sqrt{3}$
(B) $-\sqrt{3}\log_e\sqrt{3}$
(C) $-\sqrt{3}\log_e 3$
(D) $\sqrt{3}\log_e 3$

Answer: (A) $\sqrt{3}\log_e\sqrt{3}$ · Key from source paper

EdLoop JEE

Q77 JEE Main 2017 · 9 Apr · Online MCQ

If $2x = y^{\frac{1}{5}} + y^{-\frac{1}{5}}$ and $(x^2-1)\frac{d^2y}{dx^2} + \lambda x\frac{dy}{dx} + ky = 0$, then $\lambda + k$ is equal to

(A) 26
(B) -24
(C) -23
(D) -26

Answer: (B) -24 · Key from source paper

Q78 JEE Main 2017 · 9 Apr · Online MCQ

Let f be a polynomial function such that $f(3x) = f'(x)\cdot f''(x)$, for all $x \in R$. Then :

(A) $f(2) + f'(2) = 28$
(B) $f''(2) - f'(2) = 0$
(C) $f(2) - f'(2) + f''(2) = 10$
(D) $f''(2) - f(2) = 4$

Answer: (B) $f''(2) - f'(2) = 0$ · Key from source paper

Q79 JEE Main 2017 · 8 Apr · Online MCQ

If $y = \left[x + \sqrt{x^2-1}\right]^{15} + \left[x - \sqrt{x^2-1}\right]^{15}$, then $(x^2-1)\frac{d^2y}{dx^2} + x\frac{dy}{dx}$ is equal to

(A) $224\,y^2$
(B) $125\,y$
(C) $225\,y$
(D) $225\,y^2$

Answer: (C) $225\,y$ · Key from source paper

Q80 JEE Main 2017 · 2 Apr · Offline MCQ

If for $x \in \left(0, \frac{1}{4}\right)$, the derivative of $\tan^{-1}\left(\frac{6x\sqrt{x}}{1-9x^3}\right)$ is $\sqrt{x}\cdot g(x)$, then $g(x)$ equals:

(A) $\frac{9}{1+9x^3}$
(B) $\frac{3x\sqrt{x}}{1-9x^3}$
(C) $\frac{3x}{1-9x^3}$
(D) $\frac{3}{1+9x^3}$

Answer: (A) $\frac{9}{1+9x^3}$ · Key from source paper

Q81 JEE Main 2015 · 10 Apr · Online MCQ

If Rolle's theorem holds for the function $f(x) = 2x^3 + bx^2 + cx$, $x \in [-1, 1]$ at the point $x = \frac{1}{2}$, then $2b + c$ is equal to

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

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

Q82 JEE Main 2014 · 12 Apr · Online MCQ

If $f(x) = x^2 - x + 5, x > \frac{1}{2}$, and g(x) is its inverse function, then $g'(7)$ equals:

(A) $-\frac{1}{3}$
(B) $\frac{1}{13}$
(C) $\frac{1}{3}$
(D) $-\frac{1}{13}$

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

Q83 JEE Main 2014 · 9 Apr · Online MCQ

If $y = e^{nx}$, then $\frac{d^2y}{dx^2} \cdot \frac{d^2x}{dy^2}$ is equal to :

(A) ne^{-nx}
(B) $-ne^{-nx}$
(C) ne^{nx}
(D) 1

Answer: (B) $-ne^{-nx}$ · Key from source paper

Q84 JEE Main 2014 · 9 Apr · Online MCQ

If the Rolle's theorem holds for the function $f(x) = 2x^3 + ax^2 + bx$ in the interval $[-1, 1]$ for the point $c = \frac{1}{2}$, then the value of $2a + b$ is:

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

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

Q85 JEE Main 2014 · 6 Apr · Offline MCQ

If g is the inverse of a function f and $f'(x) = \frac{1}{1+x^5}$, then $g'(x)$ is equal to

(A) $\frac{1}{1+\{g(x)\}^5}$
(B) $1+\{g(x)\}^5$
(C) $1+x^5$
(D) $5x^4$

Answer: (B) $1+\{g(x)\}^5$ · Key from source paper

Q86 JEE Main 2014 · 6 Apr · Offline MCQ

If f & g are differentiable functions in $[0,1]$ satisfying $f(0)=2=g(1)$, $g(0)=0$ & $f(1)=6$, then for some $c\in]0,1[$

(A) $f'(c)=g'(c)$
(B) $f'(c)=2g'(c)$
(C) $2f'(c)=g'(c)$
(D) $2f'(c)=3g'(c)$

Answer: (B) $f'(c)=2g'(c)$ · Key from source paper

Q87 JEE Main 2013 · 25 Apr · Online MCQ

Let $f(1)=-2$ and $f'(x)\geq 4.2$ for $1\leq x\leq 6$. The possible value of $f(6)$ lies in the interval :

(A) $[15,19)$
(B) $(-\infty,12)$
(C) $[12,15)$
(D) $[19,\infty)$

Answer: (D) $[19,\infty)$ · Key from source paper

Q88 JEE Main 2013 · 23 Apr · Online MCQ

If $f(x)=\sin(\sin x)$ and $f''(x)+\tan x\, f'(x)+g(x)=0$, then $g(x)$ is :

(A) $\cos^2 x\ \cos(\sin x)$
(B) $\sin^2 x\ \cos(\cos x)$
(C) $\sin^2 x\ \sin(\cos x)$
(D) $\cos^2 x\ \sin(\sin x)$

Answer: (D) $\cos^2 x\ \sin(\sin x)$ · Key from source paper

Q89 JEE Main 2013 · 22 Apr · Online MCQ

For $a>0, t\in\left(0,\frac{\pi}{2}\right)$, let $x=\sqrt{a^{\sin^{-1}t}}$ and $y=\sqrt{a^{\cos^{-1}t}}$, Then, $1+\left(\frac{dy}{dx}\right)^2$ equals :

(A) $\frac{x^2}{y^2}$
(B) $\frac{y^2}{x^2}$
(C) $\frac{x^2+y^2}{y^2}$
(D) $\frac{x^2+y^2}{x^2}$

Answer: (D) $\frac{x^2+y^2}{x^2}$ · Key from source paper

Q90 JEE Main 2013 · 9 Apr · Online MCQ

Let $f(x)=\frac{x^2-x}{x^2+2x}, x\neq 0,-2$. Then $\frac{d}{dx}\left[f^{-1}(x)\right]$ (wherever it is defined) is equal to:

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

Answer: (B) $\frac{3}{(1-x)^2}$ · Key from source paper

Q91 JEE Main 2013 · 9 Apr · Online MCQ

If $x=\int_0^y \frac{dt}{\sqrt{1+t^2}}$, then $\frac{d^2y}{dx^2}$ is equal to :

(A) y
(B) $\sqrt{1+y^2}$
(C) $\frac{x}{\sqrt{1+y^2}}$
(D) y^2

Answer: (A) y · Key from source paper

Q92 JEE Main 2013 · 7 Apr · Offline MCQ

If $y=\sec\left(\tan^{-1}x\right)$, then $\frac{dy}{dx}$ at $x=1$ is equal to

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

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

Q93 AIEEE 2012 · 19 May · Online MCQ

Consider a quadratic equation $ax^2 + bx + c = 0$, where $2a + 3b + 6c = 0$ and let $g(x) = a\frac{x^3}{3} + b\frac{x^2}{2} + cx$. Statement 1: The quadratic equation has at least one root in the interval $(0, 1)$. Statement 2: The Rolle's theorem is applicable to function $g(x)$ on the interval $[0, 1]$.

(A) Statement 1 is false, Statement 2 is true.
(B) Statement 1 is true, Statement 2 is false.
(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 true, , Statement 2 is a correct explanation for Statement 1.

Answer: (D) Statement 1 is true, Statement 2 is true, , Statement 2 is a correct explanation for Statement 1. · Key from source paper

Q94 AIEEE 2012 · 12 May · Online MCQ

If $f'(x) = \sin(\log x)$ and $y = f\left(\frac{2x+3}{3-2x}\right)$, then $\frac{dy}{dx}$ equals

(A) $\sin\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$
(B) $\frac{12}{(3-2x^2)}$
(C) $\frac{12}{(3-2x^2)}\sin\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$
(D) $\frac{12}{(3-2x^2}\cos\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$

Answer: (C) $\frac{12}{(3-2x^2)}\sin\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$ · Key from source paper

Q95 AIEEE 2011 MCQ

$\frac{d^2x}{dy^2}$ equals

(A) $-\left(\frac{d^2y}{dx^2}\right)^{-1}\left(\frac{dy}{dx}\right)^{-3}$
(B) $\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-2}$
(C) $-\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-3}$
(D) $\left(\frac{d^2y}{dx^2}\right)^{-1}$

Answer: (C) $-\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-3}$ · Key from source paper

Q96 AIEEE 2010 MCQ

Let $f : (-1, 1) \to R$ be a differentiable function with $f(0) = -1$ and $f'(0) = 1$. Let $g(x) = [f(2f(x) + 2)]^2$. Then $g'(0) =$

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

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

Q97 AIEEE 2009 MCQ

Let y be an implicit function of x defined by $x^{2x} - 2x^{x}\cot y - 1 = 0$. Then $y'(1)$ equals

(A) -1
(B) 1
(C) $\log 2$
(D) $-\log 2$

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

Q98 AIEEE 2007 MCQ

A value of C for which the conclusion of Mean Value Theorem holds for the function $f(x) = \log_e x$ on the interval $[1, 3]$ is

(A) $2\log_3 e$
(B) $\frac{1}{2}\log_e 3$
(C) $\log_3 e$
(D) $\log_e 3$

Answer: (A) $2\log_3 e$ · Key from source paper

Q99 AIEEE 2006 MCQ

If $x^m \cdot y^n = (x+y)^{m+n}$, then $\frac{dy}{dx}$ is

(A) $\frac{y}{x}$
(B) $\frac{x+y}{xy}$
(C) xy
(D) $\frac{x}{y}$

Answer: (A) $\frac{y}{x}$ · Key from source paper

Q100 AIEEE 2005 MCQ

Let f be differentiable for all x. If $f(1) = -2$ and $f'(x) \geq 2$ for $x \in [1, 6]$, then

(A) $f(6) \geq 8$
(B) $f(6) < 8$
(C) $f(6) < 5$
(D) $f(6) = 5$

Answer: (A) $f(6) \geq 8$ · Key from source paper

Q101 AIEEE 2005 MCQ

If the equation $a_n x^n + a_{n-1}x^{n-1} + \ldots\ldots + a_1 x = 0,\ a_1 \neq 0,\ n \geq 2$, has a positive root $x = \alpha$, then the equation $na_n x^{n-1} + (n-1)a_{n-1}x^{n-2} + \ldots\ldots + a_1 = 0$ has a positive root, which is

(A) greater than α
(B) smaller than α
(C) greater than or equal to α
(D) equal to α

Answer: (B) smaller than α · Key from source paper

Q102 AIEEE 2004 MCQ

If $x = e^{y+e^{y+..10\infty}}$, $x > 0$, then $\frac{dy}{dx}$ is

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

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

Q103 AIEEE 2004 MCQ

A function $y = f(x)$ has a second order derivative $f''(x) = 6(x-1)$. If its graph passes through the point $(2, 1)$ and at that point the tangent to the graph is $y = 3x - 5$, then the function is

(A) $(x-1)^2$
(B) $(x-1)^3$
(C) $(x+1)^3$
(D) $(x+1)^2$

Answer: (B) $(x-1)^3$ · Key from source paper

Q104 AIEEE 2004 MCQ

If $2a + 3b + 6c = 0$, then at least one root of the equation $ax^2 + bx + c = 0$ lies in the interval

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

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

Q105 AIEEE 2002 MCQ

If $2a + 3b + 6c = 0 (a, b, c \in R)$ then the quadratic equation $ax^2 + bx + c = 0$ has

(A) at least one root in [0, 1]
(B) at least one root in [2, 3]
(C) at least one root in [4, 5]
(D) none of these

Answer: (A) at least one root in [0, 1] · Key from source paper

Q106 AIEEE 2002 MCQ

If $y = \left(x + \sqrt{1 + x^2}\right)^n$, then $(1 + x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx}$ is

(A) $\mathrm{n^2y}$
(B) $-n^2y$
(C) $-y$
(D) $2x^2y$

Answer: (A) $\mathrm{n^2y}$ · Key from source paper

Q107 AIEEE 2002 MCQ

$f(x)$ and $g(x)$ are two differentiable functions on $[0, 2]$ such that $f''(x) - g''(x) = 0$ $f'(1) = 2g'(1) = 4f(2) = 3g(2) = 9$ then $f(x) - g(x)$ at $x = 3/2$ is

(A) 0
(B) 2
(C) 10
(D) 5

Answer: (D) 5 · Key from source paper