



Continuity and Differentiability

Q.No.1:

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

JEE 2013

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

Q.No.2: If the function, $g(x) = \begin{cases} k\sqrt{x+1}, & 0 \leq x \leq 3 \\ mx+2, & 3 < x \leq 5 \end{cases}$ is differentiable,

then the value of $k + m$ is:

JEE 2015

- A. 2
- B. $\frac{16}{5}$
- C. $\frac{10}{3}$
- D. 4

Q.No.3: For $x \in \mathbb{R}$, $f(x) = |\log 2 - \sin x|$ and $g(x) = f(f(x))$, then : **JEE 2016**

- A. $g'(0) = \cos(\log 2)$
- B. $g'(0) = -\cos(\log 2)$
- C. g is differentiable at $x = 0$ and $g'(0) = -\sin(\log 2)$
- D. g is not differentiable at $x = 0$

Q.No.4: If for $x \in (0, \frac{1}{4})$, the derivative of $\tan^{-1} \left(\frac{6x\sqrt{x}}{1-9x^3} \right)$ is $\sqrt{x} \cdot g(x)$, then

$g(x)$ equals :

JEE 2017

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

Q.No.5: Let

$S = \{t \in \mathbf{R} : f(x) = |x - \pi| \cdot (e^{|x|} - 1) \sin |x| \text{ is not differentiable at } t\}$

. Then the set S is equal to :

JEE 2018

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

Q.No.6: Let $f : \mathbf{R} \rightarrow \mathbf{R}$ be a function defined as

$$f(x) = \begin{cases} 5, & \text{if } x \leq 1 \\ a + bx, & \text{if } 1 < x < 3 \\ b + 5x, & \text{if } 3 \leq x < 5 \\ 30, & \text{if } x \geq 5 \end{cases}$$

Then, f is:

JEE 2019

- A. continuous if $a = 5$ and $b = 5$
- B. continuous if $a = -5$ and $b = 10$
- C. continuous if $a = 0$ and $b = 5$
- D. not continuous for any values of a and b

Q.No.7: Let f be a differentiable function from \mathbf{R} to \mathbf{R} such that $|f(x) - f(y)| \leq 2|x - y|^{3/2}$, for all $x, y \in \mathbf{R}$. If $f(0) = 1$ then $\int_0^1 f^2(x) dx$ is equal to: **JEE 2019**

- A. 1
- B. 2
- C. $\frac{1}{2}$

D. 0

Q.No.8: Let $f(x) = \begin{cases} \max\{|x|, x^2\} & , |x| \leq 2 \\ 8 - 2|x| & , 2 < |x| \leq 4 \end{cases}$

Let S be the set of points in the interval $(-4, 4)$ at which f is not differentiable.

Then S:

JEE 2019

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

Q.No.9: Let $f : \mathbf{R} \rightarrow \mathbf{R}$ be a function such that $f(x) = x^3 + x^2f'(1) + xf''(2) + f'''(3), x \in \mathbf{R}$. Then $f(2)$ equals:

JEE 2019

- A. -4
- B. 30
- C. -2
- D. 8

Q.No.10: Let $f : (-1, 1) \rightarrow \mathbf{R}$ be a function defined by

$f(x) = \max\{-|x|, -\sqrt{1-x^2}\}$. If K be the set of all points at which f is

not differentiable, then K has exactly:

JEE 2019

- A. five elements
- B. one element
- C. three elements
- D. two elements