

1 Doubts

1. Arihant Amit M. Agrawal, Continuity and Differentiability, Session2, Exercise, Q3 "How is f continuous at $x = 0$ "
2. Arihant Amit M. Agrawal, Continuity and Differentiability, Session3, Exercise, Q2, (b) "How is $g(x)$ a function?"
3. Arihant Amit M. Agrawal, Continuity and Differentiability, Session5, Exercise, Q1, "How is the given function discontinuous at $x = 0$ "
4. Arihant Amit M. Agrawal, Continuity and Differentiability, JEE Type Examples, Example 2
5. Amit M. Agrawal, Continuity and Differentiability, JEE Type Examples, Example 11
6. Amit M. Agrawal, Continuity and Differentiability, JEE Type Examples, Example 12
7. Amit M. Agrawal, Continuity and Differentiability, JEE Type Examples, Example 22
8. If $f'(x)$ is given then how to identify differentiability of f ?
9. If $f(x)$ is a polynomial and has n real roots then $f'(x)$ has $n - 1$ real roots?
10. Amit M. Agrawal, Continuity and Differentiability, JEE Type Examples, Example 31
11. Amit M. Agrawal, Differentiation, Session3, Shortcut for Differentiation of Implicit Functions
12. Disprove,

If

$$f(x) = \sum_{n=1}^x x = \underbrace{x + x + x + \dots + x}_{x \text{ times}}$$

then

$$f'(x) = \sum_{n=1}^x 1 = \underbrace{1 + 1 + 1 + \dots + 1}_{x \text{ times}} = x$$

\therefore

$$\frac{d}{dx}(f(x)) = \frac{d}{dx}(x^2) = x$$

13. Neighbourhood in limits

14. [Math StackExchange Question on Continuity of Composite Functions](#)

15. [Math StackExchange Proof on Roots of Odd Degree Polynomials](#)
Doubt in answer by [Shuchang](#) in Method of IVT.

16. Let $f(x) = x^2$ and $g(x) = \sum_{n=1}^x x = \underbrace{x + x + x + \dots + x}_{x \text{ times}}$
are both f and g same?

17. Consider the function

$$f(x) = \underbrace{x + x + x + \dots + x}_{x \text{ times}}$$

What is domain of f ?

18. Consider,

$$F(x) = \max \{f_1(x), f_2(x), f_3(x)\} \quad \forall x \in \mathbb{R}$$

If $f_1(x) > f_2(x) \quad \forall x \in \mathbb{R}$

Then, Prove or Disprove

$$F(x) = \max \{f_1(x), f_3(x)\}$$

19. Prove or Disprove, If $f(x)$ is a real continuous function for all $x \in \mathbb{R}$ and f is symmetric about two different lines perpendicular to axis of x (say $x = a$ and $x = b$, $a > b$), i.e.

$$f(a - x) = f(a + x)$$

and

$$f(b - x) = f(b + x)$$

then f is periodic with period $2(a - b)$

20. Prove or Disprove,

$$\int_0^a f(x) dx = \int_0^a f(a - x) dx$$

21. Prove or Disprove,

$$\lim_{x \rightarrow 0^+} \frac{\cos^{-1}(1 - x^2)}{x} = \sqrt{2}$$

22. The range of

$$f(x) = 8^{\cos x} + 8^{\sin x}$$

23. Consider the function,

$$f(x) = \begin{cases} \frac{x}{1-x} & x \geq 0 \\ \frac{x}{1+x} & x < 0 \end{cases}$$

Can a tangent be drawn at $x = 0$?

24. Amit M. Agrawal, Continuity and Differentiability, JEE Exercise 1, Q 38

25.

26. Prove or Disprove,

$$\lim_{x \rightarrow 0^+} \frac{\cos^{-1}(1-x^2)}{x} = \sqrt{2}$$

27. The range of

$$f(x) = 8^{\cos x} + 8^{\sin x}$$

28. Consider,

$$f(x) = \begin{cases} x+b & x < 0 \\ \cos x & x \geq 0 \end{cases}$$

Find b such that f is differentiable at $x = 0$.