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, Differentiatiion, Session3, Shortcut for Differentiation of Implicit Functions

12. Disprove,

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

$\therefore$

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

13. Neighbourhood in limits

14. Math StackExchange Question on Continuity of Composite Functions

15. Math StackExachange Proof on Roots of Odd Degree Polynomials
Doubt in answer by Shuchang in Method of IVT.

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

17. Consider the funciton

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

What is domain of f?

18. Consider,

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

If $f_1(x) > f_2(x)\ \forall\ x \in \mathbb{R}$
Then, Prove or Disprove

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

19. Prove or Disprove, If $f(x)$ is a real continous 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,

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