Mathematics 1 - Differentiation

Topics : Computer engineering
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1. **Definition:**
    - Differentiation measures how a function changes as its input changes.
    - The derivative of a function represents the rate of change of the function with respect to its variable.
2. **Derivative Notation:**
    - The derivative of a function f(x) with respect to x is denoted by f'(x) or df/dx.
    - The derivative represents the slope of the tangent line to the graph of the function at a given point.
3. **Derivative Rules:**
    - Constant Rule: The derivative of a constant is 0.
    - Power Rule: If f(x) = x^n, then f'(x) = nx^(n-1).
    - Sum/Difference Rule: The derivative of the sum or difference of two functions is the sum or difference of their derivatives.
    - Product Rule: The derivative of the product of two functions is the first function times the derivative of the second function plus the second function times the derivative of the first function.
    - Quotient Rule: The derivative of the quotient of two functions is the denominator times the derivative of the numerator minus the numerator times the derivative of the denominator, all divided by the square of the denominator.
    - Chain Rule: If y = f(g(x)), then dy/dx = dy/dg * dg/dx.
4. **Applications of Differentiation:**
    - Differentiation is used to find maximum and minimum values of functions (optimization), to determine rates of change in real-world problems, and to analyze the behavior of functions.
5. **Higher Order Derivatives:**
    - The second derivative represents the rate of change of the rate of change of a function and is denoted by f''(x) or d^2f/dx^2.
    - Higher order derivatives represent successive rates of change of a function.
6. **Implicit Differentiation:**

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- Implicit differentiation is used to find the derivative of functions that are defined implicitly by equations rather than explicitly.

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