Derivatives of Algebraic Functions

Class Lecture for Grade 11 / 12

Introduction

- • What is a Derivative?
  - • It represents the rate of change of a function.
  - • It gives the slope of the tangent at any point.

Definition of Derivative

- If y = f(x), then derivative is defined as:
  - $f'(x) = \lim_{h \to 0} [f(x+h) - f(x)] / h$
  - It measures instantaneous rate of change.

Power Rule

- If $f(x) = x^n$,
  - Then $f'(x) = n\, x^{n-1}$
  - Example: $d/dx\ (x^5) = 5x^4$

Constant Rule

- If f(x) = C (constant),
  - Then f'(x) = 0
  - Example: d/dx (7) = 0

Constant Multiple Rule

- If $f(x) = Cg(x)$,
  - Then $f'(x) = C\, g'(x)$
  - Example: $d/dx\ (4x^3) = 12x^2$

Sum & Difference Rule

- If $f(x) = g(x) \pm h(x)$,
  - Then $f'(x) = g'(x) \pm h'(x)$
  - Example: $d/dx\ (x^2 + 3x) = 2x + 3$

Solved Example 1

- Find derivative of $f(x) = 3x^4 + 2x^2 – 5x$
  - Solution:
  - $f'(x) = 12x^3 + 4x – 5$

Solved Example 2

- Find derivative of $f(x) = 7x^3 - 4x + 9$
  - Solution:
  - $f'(x) = 21x^2 - 4$

Solved Example 3

- Find derivative of f(x) = √x = x^(1/2)
  - Solution:
  - f'(x) = (1/2)x^(-1/2)

Practice Questions

- Find derivatives of the following:
  - 1) $f(x) = 5x^5 - 3x^2 + 6$
  - 2) $f(x) = 8x^4 + x - 10$
  - 3) $f(x) = 6x^3 - 2x^2 + 4x$

Conclusion

- • Derivative shows rate of change.
  - • Use basic rules for algebraic functions.
  - • Practice regularly to master differentiation.