Dr.SNS RAJALAKSHMI COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Accredited by NAAC – UGC with 'A+ Grade (Cycle IV)
(Recognised by UGC, Approved by AICTE & Affiliated to Bharathiar University)
Coimbatore- 49

DEPARTMENT OF MATHEMATICS

21UCR304: BUSINESS CALCULUS AND FINANCIAL COMPUTATION

MINIMA AND MAXIMA

Ms.P.DEVIE ABIRAMI,

Assistant Professor,

Department of Mathematics

Definition

- **Maximum:** A function value is maximum at a point if it is **greater than all nearby values.**
- **Minimum:** A function value is minimum at a point if it is **smaller than all nearby values.**

Conditions

- To find maxima and minima:

1. Find the first derivative of the function.
2. Solve for derivative = 0 to find critical points.
3. Use second derivative test:
   - $f''(x) > 0 \rightarrow$ Minimum
   - $f''(x) < 0 \rightarrow$ Maximum
   - $f''(x) = 0 \rightarrow$ Test inconclusive

Problems

Problem: Find the maxima and minima of $f(x) = x^2 - 4x + 5$

Solution:

1. First derivative: $f'(x) = 2x - 4$
2. Set $f'(x) = 0 \rightarrow 2x - 4 = 0 \rightarrow x = 2$
3. Second derivative: $f''(x) = 2$
4. Since $f''(2) > 0 \rightarrow$ Minimum at $x = 2$
5. $f(2) = 2^2 - 4*2 + 5 = 1 \rightarrow$ Minimum value = 1

Problems

Problem: Find maxima and minima of $f(x) = x^3 - 3x^2 + 4$

Solution:

1. First derivative: $f'(x) = 3x^2 - 6x$
2. Set $f'(x) = 0 \rightarrow 3x^2 - 6x = 0 \rightarrow x(x - 2) = 0 \rightarrow x = 0, x = 2$
3. Second derivative: $f''(x) = 6x - 6$
4. $f''(0) = -6 < 0 \rightarrow$ Maximum at $x = 0$

   $f''(2) = 6 \rightarrow$ Minimum at $x = 2$
5. Values:
   - $f(0) = 4 \rightarrow$ Maximum value $= 4$
   - $f(2) = 8 - 12 + 4 = 0 \rightarrow$ Minimum value $= 0$

THANK YOU