

**Dr.SNS RAJALAKSHMI COLLEGE OF ARTS AND SCIENCE
(Autonomous)**

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Coimbatore- 49**



DEPARTMENT OF MATHEMATICS

**21UCR304: BUSINESS CALCULUS AND FINANCIAL
COMPUTATION**

MINIMA AND MAXIMA

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- **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.

- 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

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. $f(2) = 2^2 - 4 \cdot 2 + 5 = 1 \rightarrow$ Minimum value = 1

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