

Module M11 Differential Calculus

1. Real Numbers: Axiomatic definition. Intuitive idea of completeness.
2. Real-valued functions defined on an interval : Limit of a function (Cauchy's definition). Algebra of limits. Continuity of a function at a point and in an interval. Acquaintance (no proof) with the important properties of continuous functions on closed intervals.
3. Derivative – its geometrical and physical interpretation. Sign of derivative – Monotonic increasing and decreasing functions. Relation between continuity and differentiability.
4. Successive derivative – Leibnitz's Theorem and its application.
5. Mean Value Theorems and expansion of functions like $e^x, \sin x, \cos x, (1+x)^n, \ln(1+x)$ (with validity of regions).
6. Applications of Differential Calculus : Maxima and Minima, Tangents and Normals, Pedal equation of a curve. Definition and examples of singular points (viz. Node, Cusp, Isolated point).
7. Indeterminate Forms : L'Hospital's Rule : Statement and problems only.
8. Sequence of real numbers: convergence, Cauchy criteria and other elementary properties. Series of real number, Absolute and conditional convergence of series.