



# BASIC CALCULUS - 1

## PROF. ARINDAMA SINGH

Department of Mathematics

IIT Madras

**PRE-REQUISITES** : School Mathematics

**INTENDED AUDIENCE** : B.Sc.

## COURSE OUTLINE :

This course is a follow up to the calculus course taught in schools. Some of the notions done earlier will be presented in a more rigorous manner and some new notions will be introduced. The course aims at treating rigorously the notions of continuity, differentiability and integrability and their applications.

## ABOUT INSTRUCTOR :

Prof. Arindama Singham a professor in the Department of Mathematics, Indian Institute of Technology Madras, Chennai (India). I typically teach courses related to Logic, Theory of Computation, Linear Algebra, Numerical analysis, and Differential Equations. My research interests include Knowledge Compilation, Singular Perturbation, Mathematical Learning Theory, Image Processing, and Numerical Linear Algebra. All are related to Computational Mathematics. I enjoy teaching more than doing research; thus for me, research is a means to make myself fit for teaching. Though I do not like to use any particular method, I am attracted towards Moore's method, albeit, in a softer way. I gain much by interacting with students and ofcourse, they gain more than what they might have anticipated. Over the years, I came to believe in the maxim of Lebesgue -- 'Think in front of students'. This does not mean 'no preparation on my part'. On the contrary, interaction with students requires much more preparation than one does for usual 'one way' lectures."

## COURSE PLAN :

- Week 1:** Real numbers, Functions and their graphs.
- Week 2:** Limits of functions, Left and Right hand limits.
- Week 3:** Continuity, Intermediate value property.
- Week 4:** Differentiation, Chain rule, Implicit differentiation.
- Week 5:** Extreme values, Rolle's theorem, Mean value theorems.
- Week 6:** Local extrema.
- Week 7:** Limits at infinity, Infinite limits, Asymptotes, Differentials.
- Week 8:** Definite integrals, Area, Mean value theorem.
- Week 9:** The fundamental theorem, Indefinite integral.
- Week 10:** Integration by substitution, Area between curves.
- Week 11:** Volume by slicing, Volume of revolution, Cylindrical shells.
- Week 12:** Lengths of plane curves, Area of surface of revolution.