Calculus for Social Scientist

I Course Objectives

The main goal of this class is to build a thorough knowledge of Calculus techniques, both differentiation and integration. Due to the speed of the course a set of notes will be available for download before each lecture. Reading is essential to grasp the deeper concepts and to be ready to solve problems using the techniques. A list of topics by week is included below.

II Instructor: Don Eckford   Email: don.eckford@gmail.com

Office Hours: MWF Hour after class

III Class Organization, Time, and Location

MTWThF 9-10 am   Room?

IV Textbook(s) and other materials

Recommended: Simon and Blume, Mathematics for Economists; Norton 1994;

Access to a single variable calculus text will be helpful. Most of the class will be self contained with notes provided.

Online Sources: There are many places online where you can see videos of individuals solving problems like we will do in class. Simply “google” the name of a concept to find an example.

Recommended: MIT OCW; Coursera or Ed.X depending on the course and schedule.

ISBN 0-393-95733-0
Schedule:

First Day Notes: Introduction to Derivatives; Limits and Continuity, Discontinuity; Product Rule, Quotient Rule, Chain Rule, Higher Derivatives; Implicit Differentiation, Inverse Functions; Derivative of exponentials

The Rest of 1st Week: Linear Approximation, Quadratic Approximation; Sketching Graphs; Optimization Problems, Newton's Method; Mean Value Theorem, Differentials, Antiderivatives, Integration by Substitution, Introduction to Differential Equations

Week 2: Separation of Variables, Definite Integrals; Riemann Sums, Fundamental Theorem of Calculus; Applications of FTC, The Second FTC, Natural log function; Definite Integrals, Calculating Volumes; Integrals and Averages, Integrals and Weighted Averages, Integrals and Probability


Week 4: Analysis, Cauchy Sequences, Lim Sup, Lim Inf; Compact Sets, Bolzano-Weierstrass Theorem, Converse of Bolzano-Weierstrass Theorem, Connected Sets; Norms, Norms on Function Spaces, Finite Covering Property, Heine-Borel Theorem; Weierstrass and MVT, Rolle's Thm; Taylor Polynomials in R1 and R2, Second Order Optimization Conditions, Constrained Optimization

Homework:

Problem Sets will be added to the class CTools Site: I will need your email and your will have to establish a "friend account with the University of Michigan at https://friend.weblogin.umich.edu/friend/

After I add your email to the site you may log on at ctools.umich.edu for class announcements and notes.