UBC Mathematics 120, Fall 2014
Honours Differential Calculus

Course Website

http://www.math.ubc.ca/∼yxli/m120_14.html

Text

Robert A. Adams and Christopher Essex: *Calculus: Single Variable* , 8th Edition, Pearson, Toronto, 2013.

Brief introduction

Math 120 is the honours version of differential calculus corresponding to Math 100 for other students. Materials covered in both courses are mostly similar. Math 120 is aimed at delivering these materials in more fundamental and theoretical depth and giving more challenging exercises.

Prerequisites

MATH 12. High-school calculus and one of (a) a score of 95% or higher in BC Principles of Mathematics 12 or Pre-calculus 12; or (b) a score of 95% or higher in the BC provincial examination for Principles of Mathematics 12 or Pre-calculus 12; or (c) BC Principles of Mathematics 12 or Pre-calculus 12 with a letter of invitation from the Mathematics Department based on performance in the Euclid Contest; or (d) permission from Mathematics Department Head.

Course schedule (preliminary and may be changed without notice):

Chapter/Section in text (Hours)

Preview and Review — Ch. P (∼ 3 hrs)

- Real numbers, intervals, and absolute values — P.1
- Equalities and inequalities — P.1
- Functions — P.4
- Preview of calculus

1 Limits and Continuity — Ch. 1 ($\sim$ 5 hrs)

- Limits of sequences and functions — 1.1-1.3
- Limit rules (laws) — 1.2
- Continuity — 1.4
- Intermediate Value Theorem — 1.4
- Formal definition of limit — 1.5

2 Differentiation — Ch. 2 ($\sim$ 10 hrs)

- Tangents, their slopes, and derivatives of a function — 2.1-2.2
- Differentiation rules (including chain rules) — 2.3
- Higher-order derivatives and implicit differentiation — 2.6, 2.9
- Mean Value Theorem — 2.8

3 Elementary functions and their derivatives — Ch. P.4, 3 (7 hrs)

- Inverse functions
- Exponential and logarithmic functions
- Trig and inverse trig functions

4 Applications — Ch. P.4, 4 (8 hrs)

- Curve sketching — P.4, 4.4-4.7
- Maximum and minimum (extreme-value) problems — 4.8
- Related rates — 4.1
- l'Hôpital's rule — 4.3

5 Approximation methods — Ch. 4 (7 hrs)

- Linear approximation — 4.9
- Taylor polynomials — 4.10
- Taylor series

Class Tests (2 hrs)

(Total time $\approx$ 42 hrs.) (Yue-Xian Li, September 2014)