

# Advanced Mathematics II Topics

## 1 Summary of Topics

### Lectures 1-3

- \* Review of Integration Topics: Fundamental Theorem of Calculus, Integration by Parts, Integration by Substitution, Fubini and Young's Theorems.
- \* Review of Ordinary Differential EQ: First Order Linear Equations.
- \* Factor Demand: Cobb-Douglas Factor Demand, CES Factor Demand.
- \* A Limit Theorem: L'Hospital's Rule.
- \* Approximation Theorems: Mean Value Theorem, Log Linearization, Taylor Series Approximation, Translog Production Function.
- \* Numbers and Distances: Numbers and Vectors, Dot Products, Cauchy-Schwarz, Norms, Euclidian Distance.
- \* (Sub)sequences and Limits: Sequences, Subsequences, Cauchy Sequences.

### Lectures 4-6

- \* LyX Typesetting (no it's not on the exam but a good skill).
- \* Supremum/Infimum/Max/Min,  $\limsup$  /  $\inf$ .
- \* Sets: Closed, Bounded, Compact, Convex.
- \* Continuity, Weierstrass Theorem.
- \* Brouwer's Fixed Point Theorem
- \* Multivariate Derivative, Quadratic forms
- \* Concavity/Convexity, Negative/Positive Definiteness.

### Lectures 7-9

- \* Structuring optimization problems: compactifying a domain, interiority, locality.
- \* Necessity and sufficiency.
- \* Unconstrained optimization: necessary/sufficient conditions, version under concavity.
- \* Equality constrained optimization: necessary/sufficient conditions, version under concavity.
- \* Shadow value of constraints.
- \* Inequality optimization: necessary/sufficient conditions, version under concavity.
- \* The Envelope Theorem.
- \* Additional Advanced Topics.

### Lectures 10

- \* Review.