



Subject: Calculus and Optimization

SYLLABUS

Topic 1. Calculus: Functions of one variable

- 1.1. Derivatives
- 1.2. Taylor series
- 1.3. Integrals
- 1.4. Economical applications

Topic 2. Calculus: Functions of several variables

- 2.1. Partial derivatives
- 2.2. The chain rule; Derivatives of functions defined implicitly
- 2.3. Differentials
- 2.4. Homogeneous functions

Topic 3. Concavity and convexity

- 3.1. Concavity and convexity in one variable
- 3.2. Concavity and convexity in several variables
- 3.3. Quasiconcavity and quasiconvexity

Topic 4. Optimization

- 4.1. Necessary and sufficient conditions for a local optimum
- 4.2. Conditions which assure that a stationary point is a global optimum

Topic 5. Optimization (equality constraints)

- 5.1. Lagrange's multipliers method
- 5.2. Interpretation of Lagrange multipliers
- 5.3. Conditions which assure that a stationary point is a global optimum
- 5.4. Envelope theorem

Topic 6. Optimization (inequality constraints)

- 6.1. Necessary Kuhn-Tucker conditions
- 6.2. Sufficient Kuhn-Tucker conditions

References:

1. Chiang A. C., Wainwright K., *Fundamental Methods of Mathematical Economics*, New York: McGraw-Hill, 2005
2. Curt P., Filip D. A., *Quantitative Methods in Economics*, Editura Mediamira, Cluj-Napoca, 2009
3. Simon P., Blume L., *Mathematics for Economists*, New York: W. W. Norton, 1994
4. Sydsæter K., Hammond P., *Essential Mathematics for Economic Analysis*, Massachusetts: Prentice Hall, 2002.
5. Sydsæter K., Hammond P., Seierstad A., Strøm A., *Further Mathematics for Economic Analysis*, Boston: Prentice Hall, 2005.